

THE SIGNIFICANCE OF ECONOMIC LAND USE SURVEYS IN CONSERVATION PROGRAMS¹

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It is needless to say that all natural resources are not boundless. Through continuous use certain resources are certain to be exhausted unless proper steps are taken to conserve them. We, as a young nation, have learned this fact partly from the experience of older settled areas and partly from our own experience. In older settled areas it had been realized long ago that it is in the public interest to conserve natural resources, hence conservation measures have been practised for years; whereas here in Canada we are just beginning to realize that something should be done to conserve our natural resources.

Being an agricultural group, or at least being closely connected with agricultural work, when we talk about natural resources, our thoughts are immediately directed toward land—to be more specific, agricultural land, for it is in this type of land that we are primarily interested.

WHAT IS CONSERVATION?

Just what does the word "conservation" imply when used in connection with natural resources? For clarification purposes it is appropriate to quote a well-known authority on this subject. Zimmerman states:

"Conservation is any act of reducing the rate of consumption or exhaustion for the avowed purpose of benefiting posterity." (5).

These words state briefly but very precisely what is actually involved in any conservation program as applied to natural resources. The word "exhaustion" would apply in the case of agricultural land.

The problem of conserving agricultural land is a national one. The people in Nova Scotia are just as much concerned over the condition of their land as are the people in Saskatchewan or British Columbia. Considering the fact that almost 30 per cent of the population in Canada is dependent directly on land for its livelihood, it is no wonder that to-day we hear and read more and more about soil depletion and soil erosion. The all important questions are: "What of the future?" "Will our soil last forever?" "Are we doing anything to conserve our agricultural lands?"

This brief introduction has been presented with a view of stressing the fact that the problem of conservation of our agricultural lands exists; that it is a national problem; and that some action is necessary for the development of a conservation program.

¹ A paper delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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While many individuals are interested in the conservation of agricultural land some are more directly concerned than others. The farmer who has actually operated a parcel of land for a number of years is very probably the first one to realize that the soil on that particular parcel is not so productive as it was when he first acquired it. His neighbour has probably noticed the same thing. Gradually it becomes evident to the community that the problem of soil exhaustion is beginning to show up, and the natural reaction is that some steps should be taken to remedy the situation. Here is where the technical men step in with a view to utilizing their knowledge and training for the benefit of the community. In other words, a conservation program is in the making. Action is being planned to prevent further deterioration of land.

CONSERVATION PROGRAMS MUST BE CO-OPERATIVE

Before a proper conservation program can be developed, factual information is necessary. Unless all available facts are collected and analysed there is always the danger that the plan for action may not be the best. An ill-conceived plan may do more harm than good and the problem be not solved but more confused. It becomes evident then, that to deal effectively with the problem, co-operation of many agencies is required.

It has already been intimated that conservation of agricultural land is important in any settled region. However, certain areas, by virtue of their size, physical characteristics, economic and social considerations, may require attention sooner than others. Being a westerner, and one whose experience in agricultural work has been confined to the prairie provinces, the author will deal with particular problems of conservation in the West. His experience may only apply to specific problems in the West, but nevertheless there are always some aspects of the work common to all regions, and lessons learned here with respect to conservation programs may well apply to other regions as well.

Having mentioned the fact that co-operation of many agencies is necessary in the development of conservation programs, it is now proposed to deal specifically with the economic aspects of conservation. It is in this field that the agricultural economists make a direct contribution.

The agricultural economist is both an agricultural scientist and an economist. He is concerned indirectly with all the problems of the production people as well as with the physical aspects of the land, and directly with the relationships that exist between these and the economic factors. He deals directly with the people and the institutions set up by them. He is interested in each farm operator for the simple reason that individuals make up a community.

Once a certain action is recommended, which has conservation measures as its objective, then it is obvious that certain adjustments in land use will have to be made. But with adjustments in land use, factors of costs and management as related to production and land use will have to be dealt with. The soil scientist classifies the soil irrespective of legal boundaries of land. Soil boundaries unfortunately do not follow those conveniently established by man. The animal and plant scientists study the production problems. Agricultural engineers deal with the mechanical aspects of

production. All these and others are directly or indirectly concerned with questions of land use problems. Yet we cannot fail to recognize the fact that there exists a definite relationship between land use and production factors on the one hand, and cost factors on the other.

LAND USE SURVEY TECHNIQUE

To examine and study a certain problem area or in fact any area which might be considered as a potential problem area, the economist makes use of such projects as land use surveys. In land use surveys pertinent information is collected from the people who have lived in the problem area for some time and who have gained certain experiences which collectively can be analysed and presented to those who are actively engaged in instituting conservation schemes. Thus, in presenting his findings, the economist has made a specific contribution toward the initial stages of the conservation program by indicating the extent of the problem and what factors are involved in the approach toward its solution.

As a further contribution toward the development of a conservation program, land classification surveys are made. In these types of surveys, land is classified according to its most probable use in the light of past performance. Such information should be useful in guiding administrative authorities in implementing conservation measures, since conservation measures are essentially based on the use of land. The fact that the first community pastures in Saskatchewan, established under the Prairie Farm Rehabilitation Act, were built in areas for which land classification maps were available is one example of the significance attached to land classification. Land classification should be useful in that it provides information regarding the potentialities of the various grades of land as well as information with respect to marginal and submarginal areas. It may be interesting to note that in the Provinces of Saskatchewan and Alberta over 28 million acres of land have been classified to date. For the information of those who are not acquainted with conditions in the West, it should be mentioned that the classification was done on the basis of one-quarter section (160 acres) which is usually the standard size of a legal sub-division of land used in making up a farm unit.

Land use and land classification surveys are instrumental in correcting public opinion regarding conservation measures. Many of us will recall the days of such over-exaggerated statements, made by fairly prominent men in public life, as that "all land in Saskatchewan south of the C.P.R. should be closed to wheat farming and turned into ranching land". Land use surveys conducted in that area since 1935 have found that, from a long-term point of view, much of the land is very suitable for wheat production and will probably remain as such in the future.

LAND USE ADJUSTMENTS

As has been mentioned previously, implementing of conservation measures means that certain adjustments in land use will have to take place. Such changes are likely to take place within individual farms as well as within the area where these farms are located. Land use surveys are designed to provide information which could be used as a guide in

making such adjustments. In this connection, here are quotations from two Dominion publications which are reports based on land use studies conducted not very long ago in areas which are considered as problem areas. Spence and Hope state:

"Land utilization studies aim at determining the type of farming best adapted to an area and to individual farms. They indicate the relationship between climate, soil, topography and various economic factors—and the effect of these on income and standard of living" (3).

In another report, Stewart and Porter state:

"The object of the classification has been stated as that of aiding in securing a greater measure of agricultural stability than has been experienced in the surveyed area in the past; it is designed as a guide to the use of land" (4).

In reality a sound conservation program in land use should be designed with a view of introducing a measure of stability in an agricultural community. That in effect means that certain accepted standards of living shall form the basis for establishing a reasonably stable economy. But standard of living and income are so closely related that one cannot be divorced from the other. It follows then that the study of factors relating to income cannot be overlooked in the development of a conservation program.

PUBLIC POLICY CONSIDERS MANY FACTORS

It should be realized that conservation of agricultural land is not an end in itself. If certain changes in land use and farm organization are recommended for optimum use of land—which means that land will be used with proper regard to its conservation—the human element cannot be disregarded. It is useless to suggest to the farmer certain recommendations which will bring about reduction in income. The farmer simply will not listen to such recommendations; he naturally is anxious to increase his earnings. If it becomes necessary to bonus farmers to bring about certain desired adjustments in land use as a conservation measure, then the administrative authorities will be interested in knowing what the cost would be. Would the net result of such actions be a loss or a profit to the nation from the long-term point of view? After all, there must be some definite limit as to how far conservation measures may go. By way of illustration, it would not be a sound policy to spend unlimited amounts of public money on conservation of sandy land in semi-arid regions. Land use and land classification surveys are intended to provide the information that would be helpful in making decisions in such matters.

Problems of land ownership and land tenure are likely to have a definite bearing on conservation programs. Will absentee owners take as much interest in conservation measures as the resident owners? Are the tenants interested in the best use of land? Are leasing provisions such as are conducive to the best use of land? Does land change hands frequently? Is there much abandonment? All these questions will come up in conservation programs. These are important considerations and they are dealt with in land use surveys.

Problems of taxation and local administration are also closely associated with conservation programs. When changes in local administration are going to take place as a result of conservation schemes, it becomes imperative to know how the public services will be affected. Will they be adequate?

What minimum services would be required and at what cost? Can the local people support such costs or will public funds have to be used? All these factors must be considered to have a complete picture.

In dealing with a democratic society, co-operation of the people who are going to be affected by conservation measures is important. No matter how good the program may be, it is not likely to be very successful if it does not meet the approval of the majority. In land use surveys a cross-section of the population is visited. During these visits farmers usually speak freely and express their own opinion as to what should or should not be done. They are made to feel that they have a definite part to play in the conservation of their land resources. One man's opinion may not be of much value but when you speak to a fair proportion of the people you obtain a general opinion which expresses the wishes of the local people. This may not always be a very important factor, but nevertheless conservation programs in a democratic country have to attach some importance to public opinion. Laws and regulations passed in connection with conservation programs will not be effective unless the people concerned feel that such laws and regulations are in part of their own making and are designed for their own benefit, present and future.

PROGRAMS MUST RECOGNIZE SOCIAL DYNAMICS

It should be stressed, too, that no matter how good a conservation program may appear at a certain time there is no guarantee that it will remain so in the future. Society is dynamic, not static, and as a result of changing conditions adjustments always take place. The purpose of land use surveys is to keep the information up to date and note the trends from time to time. This information should be useful when modifications in conservation programs are necessary because of changing conditions. For example, take the case of farm power: Twenty years ago, the horse was the main source of power on the open prairies (2), whereas to-day, tractor power predominates.

In this discussion the author has outlined how land use surveys and related projects may contribute to the solution of conservation problems, and has endeavoured to present the case in such a way as to make it clear that in planning conservation programs the work of many specialists is required. Every one of us who devotes his time and energy to studying this problem has something useful to contribute. The following words are quoted to briefly sum up the part of an economist with respect to the study of conservation problems:

"The economist cannot solve the problem of conservation. He can only state the conditions under which conservation will or will not take place. The economic factors involved are the costs of conserving as balanced against probable incomes some time in the future" (1 : p. 469).

It is gratifying to note the interest that the various sections of the community are taking in the problem of conserving land. It is apparent that the problem is not being left to the people who are only directly concerned with the soil, but that other people in responsible positions—be it financial, industrial or public life—are gradually taking cognizance of the fact that the soil is one of our most important assets and that the time has arrived to give thought to its future use. In that respect considerable

basic information has been assembled and what is required now is that fullest use be made of all available information in developing a sound conservation program. But even that should not mean that the desired goal has been reached—that because we had developed a suitable program for conserving the soil, our work had been completed. We must go farther than that. We must see that the program for action becomes a reality; that a “social philosophy” toward conservation of land becomes a living thing, that:

“The desire to conserve must become a part of the institutions, customs and thinking of a people who will gladly make sacrifices without even considering them as sacrifices” (1 : p. 473).

When our conservation programs have created the “desire to conserve”, then it can be said that they have accomplished their desired objective.

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DISCUSSION¹

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Within the difficult scope of this topic, Mr. Mysak has developed some of the pertinent aspects of the conservation problem and has indicated some of the contributions of land use study to the implementation of conservation programs. In relation to the subject title, it may be a digression to deal more directly with conservation, but it is this phase of the subject which seems to hold the greater significance.

The agricultural conservation alarms of the past two decades, particularly as they relate to Western Canada, bear a likeness to the first waves of conservation appeal which were experienced by older countries. In addition perhaps to being premature, such initial movements had the unfortunate characteristic of possessing more fervour than substance. The unhealthy gap between abstract aim and practical achievement may have delayed progressive conservation development for several decades. We in Canada stand in danger of a similar occurrence. We are raising the banner of conservation, without clear concepts of purpose, and without adequate appreciation of the requirements and techniques implied by a specific conservation objective.

¹ Delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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Conservation Demands Concrete Objectives and Methods

Sound conservation development presupposes concrete objectives defined in terms of particular conservation practices held to be applicable to a desired utilization of given resources. It envisages the possible impingement of future resource deterioration, in terms of particular characteristics of deterioration, on desired resource sufficiency, and translates it into the needs for conservation applying to each phase of resource. In turn, it translates such conservation need into specific requirements of maintenance and restorative practices within each phase of resource and resource use.

Again, sound conservation demands concrete methods of implementing its objectives. In terms of the factors determining existing deficiencies in resource conservation it seeks relevant and workable bases of resource-use adjustment. In this form it contemplates specific techniques of readjustment of the institutional structure of resource utilization, and of the institutional and other factors guiding resource users, which can be applied in the existing context of resource use.

By virtue of the complex implications of the term, any simplified definition of what conservation does or should do is inherently inadequate. It is not enough to say that conservation holds the abstract objective of benefitting posterity. Few, if any, of us have more than a superficial interest in posterity as such. The concern for posterity to which conservation relates is that of the possible reduction of desired future benefits from resources which may attend current use. Hence conservation involves evaluation of the desirability of possible future resource benefits against present benefits. It holds a concept of future preference for resource benefits, in the form of a socially evaluated preference, at variance with individually evaluated preferences and with current preferences influencing resource ownership in the use of resources. In so doing it also anticipates possible reconciliation of such preferences within a workable framework of resource-use adjustment.

What? Where? When? How Much? and How to Conserve?

Similarly, it is not sufficient to say that conservation simply involves the reduction of the rate of exhaustion of resources. In terms of conditions affecting resource requirements, adequate resource use may imply anything from ready expendability to more or less controlled exhaustion, a greater or lesser extent or immediacy of restoration, or the concerted augmentation of particular resources. Within such a broad scope of possible resource-use, needs for conservation are a variable, subject to the particular characteristics and inter-relationships of resources. Substitutability of resources, between areas, and within and between types of resources, confers a degree of dispensability upon every kind and type of resource and makes requirements of a particular resource the function of the availability of its respective alternatives. Restorability permits greater or lesser extents of restoration and greater or lesser substitutability of resources in point of time. Depletability with restorability, as in the case of many agricultural resources, juxtaposes varying degrees and rates of depletion with varying extents and immediacies of restoration. In the context of the above, varying preferences for resource benefits, and considerations of total resource economy introduce additional variables and bring into play innumerable alternatives for meeting the variable ends of desired resource use. Conservation, therefore, is not just conserving; it is the intricate decision of what, where, when, how much and how to conserve for specific phases of a resource determined relative to requirements for the resource as a whole.

The estimate of resource requirements guiding a reasonable conservation objective for an area such as Canada is complicated by unknown and uncertain factors. Directly, prospective resource need for an area is a function of population and consumption levels relative to the scale and output of the respective resource. Indirectly, however, it is determined by probable demands from outside the resource area and outside the resource type. In her important export relation, Canada's prospective agricultural resource requirements will be determined to a major extent by effective demands from outside rather than within her borders. Similarly, in terms of increasing substitutability permitted by expanding technology, and by virtue of the restorable *vs.* non-restorable character of agricultural as against many industrial resources, agricultural resource requirements are likely to be governed increasingly by the conditions of requirement and supply of industrial materials.

The current impact of the above factors does not lend credence to wanton profligacy with our existing agricultural resources. They also do not, on the other hand, allow the ready presupposition of an absolute or immediate need for maintenance or restoration of each and every type or phase of resource. Increasing population numbers and consumption standards are being offset to a greater or less extent by declining rates of population growth and an increased availability and efficiency of resources. Apparently inexhaustible world needs, while suggestive of high prospective resource requirements, also suggest intractable economic and political problems barring effectuation of demands which pose the ready occurrence of surpluses and excess resources for individual countries and areas. Prospective agricultural resource needs which may be determined by eventual exhaustion of non-agricultural resources provide very limited certainties within prevailing rapid economic and technological changes.

Conservation to be Based on Varying Priorities of Place, Type, and Phase of Resource

Relative to the indefinite and uncertain incidence of resource need, reasonable conservation objectives involve cautious segregation of conservation requirements. In such context, the maintenance of effective economy of total resources and effort implies the concerted assessment of conservation benefit against alternative benefits and costs for each phase of conservation effort. Within the scope of conservation need related to the degree and certainty of resource requirement, it implies the separation of acceptable conservation practice in terms of the conditions of resource depletion and restoration affecting each segment of resource. It suggests varying priorities of place, type and phase of resource, and of immediacy and method of conservation, relative to the characteristics of resource and resource deterioration involved. Destructible and depletable, restorable and non-restorable, rapidly and slowly depletive, low and high restorative, low and high cost, certain and uncertain, and their numerous extensions, each constitute different conditions giving a different validity of conservation practice within the resource area and the individual unit of resource use. As Mr. Mysak intimates at one point, reasonable conservation effort may well imply the expendability of particular resources in behalf of greater benefits attainable otherwise or elsewhere. While this may overstate the actual requirement, it appropriately emphasizes the type of choice which economic conservation practice involves. Until the real needs for conservation are translated into their relevant facets of conservation requirements, suggestions of conserving this or that, here or there, thus or so, or now or then, constitute wholly presumptive rather than purposive approaches to the conservation problem.

The implementation of conservation objectives goes beyond the creation of a favourable psychological atmosphere in the form of a presumed willingness to sacrifice. It is the unfortunate fact that past reliance on this hollow form of moral appeal has been responsible for some of the gap between expressed aims and realized results in conservation, and has frequently alienated rather than aided co-operation in constructive conservation efforts. We operate against a heavy legacy of under-concern for resources imposed by concepts of abundance and a background of necessary and unnecessary ruthlessness associated with settlement. In this setting, rehabilitation of attitudes and value concepts with respect to resources can contribute to effective conservation progress. Similarly, there are many points at which effective guidance to overcome existing inertias, and improved knowledge of efficient resource use and conservation practice, can provide the required environment for conservation consistent with economic opportunity.

However, the major phases of conservation method relate directly to the institutional factors governing resource utilization. On the one hand they comprehend basic adjustments in the structure of resource use. For the most part, they are concerned with individualized techniques for overcoming the gaps between conservation returns and costs as they concern existing resource users. These recognize the lack of economic incentive afforded to resource users by expected conservation returns, discounted with respect to time, uncertainties and preferences, in comparison with conservation costs, in the form of involved direct and alternative costs. They contemplate elimination of existing real or apparent sacrifices through institutional and other adjustments modifying the value and expectations of conservation returns and the incidence of conservation costs. With numerous other forms of concerted adjustment, these recognize possible discrepancies between social and private costs of deterioration which may justify and allow for appropriate forms of conservation aids. They also recognize the powerful conservation weapon embodied in the passage of time, which may provide automatic restoration of favourable cost-returns relationships and afford both simple and economic conservation for particular requirements. Constructive conservation depends upon the multi-barrelled attack which relates its methods to the specific causal factors which can be held to underlie existing deficiencies of resource use. It can hardly be expected to develop within a vacuum between desire and possibility left by inappropriate means.

Land Use Surveys Can Be Further Developed

Returning briefly to the subject of land use studies, these studies are affording an improved inventory of resources, and information on existing resource use, necessary to fuller understanding of the conservation problem. Their fuller orientation towards conservation purposes implies a greater emphasis on both major and detailed aspects of resource use as it concerns conservation requirements and the adaptation of conservation practices. On the one hand, it suggests more concrete evaluation of the relation of available resources and existing resource use to resource requirements in terms of the present incidences of resource deterioration. It suggests more complete analysis of the economic aspects and implications of conservation practice in terms of the particular characteristics of individual types of resources. In relation to factors determining existing uses, and in terms of a concept of appropriate conservation method, it also suggests the projection of possible bases of implementing conservation in the form of adaptable farming and land use systems and practices.

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Firstly, I wish to congratulate Mr. Mysak on the excellent job he has done in outlining the role of the agricultural economist in formulating land conservation programs. He has done well to point out that the combined skills of all agricultural workers are necessary in order to originate and carry out such programs. The agricultural economist has his part to play and Mr. Mysak has described this in detail with particular reference to land classification studies.

I would not quarrel too much with the definition quoted from Zimmerman, *viz.*, "Conservation is any act of reducing the rate of consumption or exhaustion for the avowed purpose of benefiting posterity". I would, however, point out that conservation methods should be widely practised now, not only to benefit posterity but also to benefit the actual operators on farms to-day. It is apparent that lack of proper action to conserve soil resources is adversely affecting the returns received by operators presently on farms. I am assuming that proven methods to combat soil and wind erosion, which can be practised by individual farmers, come within the definition of "conservation methods". There is no doubt that a number of things can be done by farmers which will serve to reduce the rate of exhaustion and at the same time not reduce his income. There are other cases where the rate of exhaustion may be high and the farmer is unable to cope with the cost of making changes.

This brings up the question, mentioned by Mr. Mysak, of how to obtain the necessary adjustments in land use. He states as follows: "It is no use suggesting to the farmer certain recommendations which will bring about reduction in income". Where drastic changes are contemplated, the problem of reduced farm income will occur and government subsidies may be necessary to encourage farmers to make changes. Such action may have to be taken but the thought expressed at the very end of Mr. Mysak's paper should be kept uppermost in mind: "The desire to conserve must become a part of the institutions, customs, and thinking of a people who will gladly make sacrifices without even considering them as sacrifices". This thought, of course, cannot be carried to the extreme, but the necessity of having the utmost co-operation of farm operators and all interested bodies is essential if anything worth-while is to be accomplished.

The decision as to what type of farming to recommend for a particular area is very difficult. Agricultural economists can be of great assistance to other agricultural workers in appraising the effects on farm income of changes in farm practices. The market factors cannot be disregarded and programs will have to be worked out which take them into account. It is quite possible that good farm practice will be in conflict with the immediate economic gains from a certain type of farming. Intensive and continuous study, together with educational work, will be necessary in order to bring about the changes necessary to conserve our soil reserves.

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RESEARCH IN RURAL LEVELS OF LIVING IN WESTERN CANADA¹

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In the past there has been a tendency to attach to farm management survey questionnaires some questions on family living, perhaps in order that the fiscal summary should not appear too bleak and impersonal. Family information was treated as incidental to the examination of the farm business. To-day, however, level of living studies have attained maturity, and we have instances of farm management studies being carried on to complement and support family surveys.

Sociology is the segment of social science which is particularly concerned with level of living. But the rural sociologist, when you can find him in Canada, has always recognized the affinity—the overlap, in effect—of his field and that of the economists. The latter group have not denied this, and, because of the scarcity of sociologists, have ventured in due course into studies of family living because they became progressively aware of the gap in investigation and knowledge and of the desirability of closing it somewhat without awaiting the creation of rural sociology chairs or positions, to be filled by persons necessarily trained outside Canada. No doubt this scarcity of sociologists has been no accident but rather attributable to the same assumptions which suggested for many years that farm management data reveal the important facts about those whose living comes from farming.

Studies of urban family living may still leave many questions unanswered, but the history of such work is older and fuller than for farm families. This statement would apply emphatically to Canada, as well as to the United States, where, however, there has been more than a mere scratching of the surface in rural sociology. One reason for the urban-rural contrast is surely the much greater complication in determining income, both net cash from the farm business, and farm-furnished goods; most urbanites state most of their income when they report their wages. In addition there is the obstacle of considerably greater expense in making calls in rural areas.

SASKATCHEWAN PIONEER LIVING SURVEY, 1942

There have been unsustained exceptions to the history of neglect in Canada of studies of content of rural living (rather than monetary description of the farm business). But in Western Canada at least it was observed a few short years ago that, as the body of knowledge of farm operating results in different areas, on different soil types, in different types of farm organization, grew, there was no very much clearer picture of what these results really meant to the people living on the farms.³ In 1942 a considerable investigation of the living of families farming in the northern pioneer woodland fringe of Saskatchewan was made. The survey was additional

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³ A descriptive approach to farm living was recorded in connection with the ranch business study in the West in 1940 (15). Miss Macleay wrote from her own experience rather than based on a special study.

to but closely integrated with a farm management survey calculated to show the factors affecting farm business progress in such an area. Facts concerning some 200 families were recorded for the family living survey, and these were also included in the 687 records taken in companion settlers' progress survey (22). The question was, what chance does the new north in Saskatchewan offer settlers in content of living and potential farming success?

The tentative tabulation of the level of living data (23) was so impressive that further investigation on the same basis was undertaken the following year in two long-settled areas in Saskatchewan and Alberta. These were the Saskatoon-Asquith-Langham area of central Saskatchewan and the Red Deer-Wetaskiwin area of central Alberta; and in each area an additional 200 or so families were surveyed by use of the same questionnaire. The intention was to have three areas which would represent a range of farming in the Prairie Provinces from the newest, least developed settlement, through established settlement on the open prairie, with its considerable variation from year to year between low and high crop yields, on through to settlement in the long-settled park belt areas of mixed farming and stable production. Families were selected at random in each territory, where they were about 4 per cent of all the farm families. The composite result of this combined study was published in March of this year, being *Farm Family Living in the Prairie Provinces* (8) by Florence M. Edwards. The report, while only partly statistical, amply bears out the assumption of having sampled a cross-section of farm level of living in the two provinces from a high level in west central Alberta, to a medium level in the west central Saskatchewan area, to a lower, still-developing level in northern Saskatchewan.⁴

The Economics Division is currently conducting the "same" survey of the same 624 families (or as many of these as are still to be found) in the three areas. The field work is again in two sections to provide family living data and farm management data for all the farms. The intention is to examine the living of these families after the passing of four or five years. During this period prices of farm products and of goods purchased for farm and family use have risen, and the Dominion Treasury has commenced paying family allowances to mothers of children under 16. The data will be analysed to indicate to some extent the effect on farm business success and on family living of these factors. We shall have to take due regard of other changes such as size of farm and cultivated area, family composition, labour input, public facilities, farm facilities, and so on. Some of these factors will have changed more particularly as normal results of the passage of time; other changes will have been brought about by special circumstances and will be primarily causal in nature.

The Department of National Health and Welfare is particularly interested in information which we shall report on the effect on farm family living of the receipt of family allowances. We are asking the homemakers for their statement on this and will also analyse it more objectively from the data on receipts and expenditures.

⁴ This result, almost surely corresponding to long-time average net farm income, was not obscured by the fact that Cory-Asquith-Langham farms had higher net incomes than either of the other areas in the survey year.

LEVEL OF LIVING CONCEPT

Level of living means "the way that groups actually live in contradistinction to the way they would like to live at some future time (standard of living) or the way certain of us would like to have them live (norm of living)" (19). This definition has been taken over from W. H. Sewell, upon whose work at Oklahoma A. & M. College in the 1930's the Economics Division has based to a considerable extent its technique in farm family living investigation. Similar or parallel terms to "level of living" that have been used from time to time by competent workers include "content of living", "plane of living", "scale of living", "level of consumption".⁵

The general classes of data recorded for the 624 families in our 1942-43 survey included: 1) building and farmstead rating, including structure and fixed and movable facilities; 2) family living expenses for the 12 months preceding the enumerators' visits; 3) food habits, including home provision and an examination of adequacy of diet; 4) living habits, including leisure time activities in the family and community, and health and education facts; 5) social participation and proximity to community facilities—stores, professional people, recreation; and 6) state of satisfaction and social adjustment. The enumerators were young women, most of them trained in home economics rather than sociology or economics. As J. D. Black has pointed out (2 : p. 5), several divisions of social science are involved in this study, and he puts rural sociology in first place, followed by agricultural economics, consumption economics, and home economics.⁶

The schedule drawn up in 1942 for northern Saskatchewan proved suitable for the other two areas. If it is not being used to-day in the second survey, it is yet clearly recognizable in the current questionnaire, which has been devised to provide parallel data for all information collected four years ago which was actually used in the analyses, published and unpublished. Additional principal sections on the 1947 schedule include household composition (formerly on the farm schedule) and a section on family allowance. State of satisfaction has been dropped because it was not analysed, inasmuch as the questions and answers did not make for ready standardization, and the other questions have been edited according to the experience in the tabulation. Both the first and current schedules are closely related to the farm schedule completed for the same farms. Although the latter has been and is being filled in by farm management workers interviewing the operator and the former by questioning the homemaker, few or no questions are duplicated.

This year also there will be a clinical health survey of the individuals in a sample group of the families, the work being undertaken by the Nutrition Division of the Department of National Health and Welfare. The travelling clinic will examine the people as products of good, mediocre, or poor nutrition rather than completely as to all aspects of health. This is believed to be a new and very significant phase of farm family study, and

⁵ C. A. Dawson, in his work on rural western Canadian data in association with R. W. Murchie and others, used the terms *means* and *modes* of living, the former being essentially the income and production or work pattern and the latter the expenditure pattern and other *expressions* of living. The terms have evidently not been widely echoed, but the work is prominent in the thin history of rural family living appraisal in Canada (4, 5, 6).

⁶ Black adds as other likely common fields of study in particular family living surveys: the farm family as a sociological institution; rural population; public finance and taxation; credit, marketing and prices; national policy; rural and urban stratification.

the co-ordination of the results with the food, diet, and level of living data is expected by both Economics Division and Nutrition Division workers to be notably revealing.

The history of the initial survey from field work to publication is interesting and no doubt significant of the relative immaturity of theory and technique in this field in Canada. This story is not necessarily concluded, as findings in the current survey will be compared in some detail with those already on record and new analyses may well be made. Furthermore, the bulletin is frankly of a popular nature and is, I think, a very distilled representation of what Miss Edwards had to report.

It is not proposed to outline here in detail facts of farm family living but rather the history and significance of such studies in the West.

SOCIO-ECONOMIC STATUS

Students of families for some years have been aware of the need for a method of summary expression of gradations or differences in living between families, communities, and regions. Miss Edwards prepared a companion treatise (7) to her Economics Division bulletin in the course of qualifying for her master's degree in sociology at Chicago last year. This pertained to measurement of socio-economic status, a field closely allied to levels of living and indeed dealing with very much the same subject matter. The status concept is a little narrower and more precise. For this work, Sewell has been particularly the reference or model for the Division's work (20). He in turn attributes his procedure in large measure to F. S. Chapin, who in 1928 defined socio-economic status as "the position that an individual occupies with reference to the prevailing average standards of 1) cultural possessions; 2) effective income; 3) material possessions, and 4) participation in group activity in the community" (3). Chapin is an urban sociologist, but it is not surprising that such a basic statement should be applicable to farm families.

Miss Edwards rejected the effective income component on the ground that a report for any one year would probably not be typical and because it would make the scale too cumbersome (7 : Ch. II). Since, however, family living expenditure (the meaning of effective income) is recorded as carefully as possible in the questionnaire, we are left with the opportunity of correlating status score on the three-component basis with living expenditure. Indeed, Miss Edwards has done this in one of her unpublished reports (9), and the degree of correlation—on a *per capita* basis of cash expenditure—is so great that one guesses that inclusion of the fourth component would have resulted in very similar scores and rankings. The farm management phase of the survey is being conducted primarily to provide reliable net income data for correlation with level of living findings. No doubt, however, it will prove significant to farm management people as being that all-too-rare resurvey of an area after the passing of some years.

This paper will not report much detail of the socio-economic status analysis of our 624 families,⁷ other than to state that a scale particularly designed for Western Canada has been devised, and a number of internal and external statistical tests and judgment tests confirm its high degree of

⁷ Plus 53 families near Bonnyville, Alberta, records for which were separately tabulated, except as to scale construction (13).

validity, reliability, and utility. Its manipulation is straightforward and simple though not brief, and we shall be in a position to apply it to the families again in the analysis of the current survey if it seems desirable to do so.

Our interest remains broader than just socio-economic scale analysis, however. We are tabulating this year, in addition to data which is required for rating on the scale, not only complete expenditures and perquisites, but also family composition and history, all family allowance information, and food habits.

Our workers until now have been home economists, but they did not see fit to publish the food data which they recorded! (Such data seemed not to contribute to level of living analysis.) However, the Division in its work in Eastern Canada has made a number of surveys of farm family food habits and diets.⁸ These have not been primary family living studies, although one knows at least something about a family after inquiring as to its utilization of food. It is hoped that some of the food data gathered in Alberta and Saskatchewan will be comparable with information reported by Maritime farm families.

The close relation between level of living and food practices will be apparent to a certain extent, especially facts as to adequacy of diet and response to the recent considerable volume of nutrition publicity, in preparation of meals from such food as is available from home production and purchase. The workers in the Maritime surveys have desired to express the significance of their findings by tabulating on a number of sorts such as household composition, type of farm, education, social participation, and six other groupings, including a level of living index (21). This last has been specially constructed for the area, and, being based on fewer items of possessions than our prairie index, may perhaps be more intuitive. Miss Edwards's scale had more than 80 tentative items and 27 for retention after tests of differentiation had been applied. However, the Edwards scale rates all items equally, whereas the Maritime index has a more subtle weighting. An index calculated from United States census data for plane of farm family living in all counties in 13 southern states (1) has only 6 components: value of dwelling, and possession of auto, electricity, radio, piped water, and telephone. All other aspects of living are presumed to be revealed by indirection if analysis is applied to these concrete items. Professor G. F. Warren has been quoted in this regard as having said the answers to two or three questions would give him all the measure he needed of the level of living of different farm families: Does the family eat in the kitchen? Is cream saved for coffee or cereal? Do the children go to high school? (2 : p. 33). This indicates perception; but it is perhaps parallel to the rural sociologist's saying that he knows all he needs to know of a farm's success as a business if its cows look like pretty good milkers, and the barn

⁸ In each of the Maritime Provinces for which data are now being tabulated, and (12, 24).

is painted. The technique of scale construction needs much further development, but it appears that, if 80 components are too many, 2 or 3 items are too few for consistent realistic differentiation.

OTHER CANADIAN RURAL SOCIAL STUDIES

This research is of a rather pioneer nature, with few prototypes other than in the United States and elsewhere outside Canada, but there is every reason to point out some of the exceptions. The first example of a study of rural family living in Canada to which I find reference is unrelated to the efforts of any North American social scientist. The date is 1862, and the locale is St. Irénée, a village on the north shore of the St. Lawrence River below Quebec City (10). The author is a Frenchman, M. Gauldrée-Boilleau, a disciple of LePlay, the case study sociologist. It is a study of the typical *habitant*, and gives family information and income and expenditure patterns. This LePlay approach was used again in rural Quebec before the dawn of this century by a Canadian, Léon Gérin (11). W. A. Riddell's 1914 Ontario and Manitoba rural surveys (16, 17, 18) covered some aspects of family living such as housing, reading, and social participation but not expenditures.

We next move along to the 1930's, skipping scattered urban studies, but probably no or few significant rural ones. The Canadian Pioneer Problems Committee flowered for the first part of that decade. Its membership included C. A. Dawson, head of the McGill Department of Sociology. Dr. Dawson directed the Committee's sociological work and produced three volumes in the Canadian Frontiers of Settlement series dealing in large part with western farm family living (4, 5, 6). In recent years social scientists of Laval University have done some farm family living investigation (14).

In looking to the future we have problems of technique additional to those already cited. Procedure in sampling families has received careful attention in the past; stratification on various bases has been reasonably well attained. But much further attention must be applied in this field, and no doubt the remark applies to most kinds of area surveys.

NEED FOR RURAL SOCIOLOGISTS

Family living investigations are, as has been said, logical companion projects of regional farm management studies. But, as Misses Edwards, Elliott, and Turnbull have suggested (9), a third segment of the ideal program would be community study; that is a direct investigation of the institutions and processes of rural communities rather than the fleeting glimpse one obtains by asking the extent of the family's community activities. This sort of approach formed part of the Frontiers of Settlement studies (4, 5, 6), but may now await the availability of one or more rural sociologists, rather than other bright people sympathetic to the sociological point of view.

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In the short time he allotted, Mr. Reid has covered the subject of research in levels of living in Western Canada quite fully and adequately. It is proposed in the formal discussion of this paper assigned to me to make two general observations, and these are merely supplementary to what has already been touched upon.

The first is a comment on the genesis and development of the level of living studies with an explanation of the *why* and the *wherefore*; and a second which will touch upon the construction of a scale for measuring level of living.

Early Farm Management Surveys Were Partly Sociological

Beginning in 1930 and in all farm management surveys subsequently conducted in the West, information on the farm family cash living has been obtained; and, of course, information had been obtained on the non-cash living items (which are the farm perquisites) in the first farm management study carried out in Saskatchewan by Dr. William Allen in 1926 and in all subsequent ones. Likewise, information on the composition of the farm family, operator's history, and location of farm in respect to trading, educational and cultural institutions has been assembled.

Whether or not provision for obtaining such near-sociological information would have been made without the influence of the sociologists with whom the earlier students in the field of farm management were associated in the Pioneer Problems Committee, which functioned in 1930 and 1931, I do not know. The fact remains that the sociologist had a hand in framing the schedules which were used in 1930; and the same schedules, with some amendments, have been used generally in subsequent years wherever fairly complete records of the farm business were obtained. One of the reasons for retaining the section on cash family living costs is the method of enumeration which we have followed; namely, the use of the cash trial-balance as a check for omissions and distortions in receipts and expenses.

Since the beginning of our series of studies in land utilization and their practical application, the farm family cash living has been used as a measure of considerable importance. It has served as the keystone to the determination of what constitutes a marginal farm business. For a group average of farm businesses somewhat homogeneous for type, size, location in respect to climatic hazards and quality of land, the family cash living costs were admitted as wages for the operator and members of his family as being adequate or otherwise to induce the operator to remain on the land and continue to farm it. The surplus above these living costs in addition to the operating and maintenance costs has been the determinant factor for a better than marginal unit.

This same measure—farm family cash living—was used to determine the acreage of farm land required in the irrigation districts under different types of farming for a so-called economic unit; and again in the more recently settled woodland areas of northern Saskatchewan, Alberta and the interior of British Columbia.

Content of Living Needs More Than Monetary Definition

But, as you know, the cash spent on living does not reveal the whole content of living; nor do the living costs plus farm perquisites, as ordinarily obtained on a farm management schedule, give the whole of the living content. We had that strikingly revealed to us in one of our earliest northern pioneer farm business studies. During the drouth of the middle and late thirties, farm families whose total living costs, cash and non-cash, ranged from \$500 to \$1,000 on the southern prairies lived on little more than half these amounts on their new location on bushland farms in the north. Some were happy for the move; others who located on less promising land, in less promising communities, or for other reasons, were disappointed and saddened. Stories emanated from these frontier regions of the low standards of living into which these people were grooving themselves; of the family difficulties due to the extreme poverty of the people as a result of crop failure after crop failure on the prairies, and the task being undertaken of clearing for themselves with little or no capital farms on bush land.

This, then, is the background to the level of living studies. It was not our intention as rural economists to inquire into the family relationships and other matters strictly within the field of the sociologist, but merely to portray the more tangible things which constituted the content of living, and these in relation to the type of farming, the land and

¹ Delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alta., June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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its management. Above all, we wanted to be able to put some definite connotation to this thing which is commonly referred to as a "decent standard of living" or an acceptable standard of living, and this in various situations and under different conditions of farming. This brings me to my second observation.

Level of Living Scales

We are students primarily in the field of farm management and hence, as would be expected, we have been trying to develop some objective means of rating levels of living for use in Western Canada. Mr. Reid referred to the Edwards scale for rating socioeconomic status of farm families. This scale is an objective measure of levels of living developed from our own series of studies, but we do not feel that it has been adequately tested. In this connection I would like to mention the earlier work done by Miss Helen Turnbull, who commenced the series of studies for us back in 1942 in northern Saskatchewan, and contributed much. Her approach to a measuring scale was somewhat different from that of Miss Edwards and involved a weighting of the several criteria used in the composition of the scale. She went after and obtained a fuller account of the diets and health of the people and tried to relate the adequacy of diet to health of the farm families. In this regard our approach was a subjective one, and we had not gone far before we recognized our limitations: food as one phase of content of living was discarded as a workable criterion for a measure of level of living without a more objective means of determining the health of farm families. We are hopeful that the survey of the associated clinic with the current level of living study will permit the adoption of an adequacy-of-diet measurement as one of the components of a level of living rating.

Mr. Reid indicated the reasoning for leaving the effective income out of the Edwards' scale, which finally was made up of items on three classes: (1) material possessions; (2) cultural possessions, and (3) participation in group activity in the community.

The current level of living survey will not give a fair basis of testing the applicability of the scale. The reason for this is obvious, because the same farm families who co-operated in the studies four years ago are the co-operators in the repeat study. For scale testing, other areas, or in any case an entirely new set of co-operators, should have been chosen. But the emphasis in this year's study is being placed on discovering the changes which have taken place in the level of living in the four-year interval and to try to appraise the various causal factors. Chief among these, of course, is the increased income; this is of two classes—that from the farm business, and that received directly from the state through family allowances.

A PROPOSED METHOD, CONSISTENT WITH ECONOMIC PROGRESS, OF SUPPORTING FARM INCOME DURING PERIODS OF DEPRESSION¹

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I

CHARACTERISTICS OF AGRICULTURAL INCOME

The disadvantaged position of agriculture relatively to that of the secondary industries in the economy during periods of depression has long been recognized. During the downswing of the business cycle farm people are extremely vulnerable since the prices of farm products tend to be flexible while the prices of industrial products are more rigid. Such a differential in the price flexibilities of farm and non-farm products arises largely from the ability and willingness of industrial firms to curtail their output as demand for their product declines.

Since firms in agriculture are not able to take advantage of any inelasticity in the demand for their products by restricting output, the terms of exchange between farm and non-farm products worsen during periods of depression.³ Cycle-wise the money incomes of farm people are subject to sharp ups and downs while the amplitude of the fluctuations in their real income is greater still. The impact of these economic factors upon the size and variability of the farm income stream is entirely apart from fluctuations in output caused by weather.

Defects of Parity Concept

The measures adopted, particularly in the United States, during the thirties to alleviate this disadvantaged position of the farmer during the downturn of the cycle have been subject to grave defects. These palliatives centred upon an effort to raise the prices of farm products towards the

¹ A paper delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1946, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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³ The author has constructed an index of prices received by Saskatchewan farmers for the period 1931-45 using a price base of 1935-39 = 100 and average annual marketings for the period 1935-44 as weights. The index of prices paid is that of the Dominion Bureau of Statistics for Western Canada and includes commodities and services used by farmers and farm living costs. Taxes and interest rates are included but wage rates are excluded (3).

—	Index of prices received, 1935-39 = 100	Index of prices paid, 1935-39 = 100	Ratio of prices received to prices paid
1931	59.9	102.4	58.5
1932	52.8	98.2	53.8
1933	57.8	94.9	60.9
1934	76.4	98.1	77.9
1935	83.3	97.7	85.3
1936	94.0	98.6	95.3
1937	136.1	103.3	131.8
1938	107.1	101.6	105.4
1939	79.6	98.7	80.6
1940	85.8	104.7	81.9
1941	93.0	107.0	86.9
1942	110.3	115.4	95.6
1943	139.3	118.7	117.4
1944	170.4	121.3	140.5
1945	172.2	121.0	142.3

goal of parity. The devices used to further this objective included, among others, production control, storage programs, surplus disposal plans and export subsidies. Canadian farmers during this period received relatively few of the special considerations accorded to farmers in the United States. Resort here was had to direct relief, feed and seed loans together with some subsidization of the price of wheat.⁴ Canadians are now very properly concerned about the effects of declines in the price of their products once the present abnormal demand for foodstuffs has subsided.

The Americans have inherited a farm program which was devised on the morning of a crisis. Fortunately we have both more time and probably a much clearer grasp of "the agricultural problem" than was available during the early thirties. Notwithstanding this increased knowledge there is still considerable support in Canada for techniques such as production control and parity prices which have little to recommend them.

Professor Schultz' analysis of the secular problem is well known (5, 6). The lower *per capita* returns to people in agriculture are a reflection of an excessive labour supply in this industry resulting from higher birth rates, a high rate of technological development and the failure of the demand for food to expand in direct proportion to the expansion in the income of consumers.⁵ Over the longer run, therefore, the income of farm people, apart from transfer payments, will be improved relatively to those engaged in other industries only if we facilitate the continual rural-urban movement of population.

It is with the plight of agriculture during the depression phase of the business cycle that we are more particularly concerned here. The first and best line of defence against the effects of economic depression lies, of course, in a direct attack upon the business cycle itself. Various techniques which are thought to be appropriate to this end have been devised. They include deficit financing on the national level and an international employment stabilization fund (7) on the international level. In the interests of

⁴ Briefly two methods were used to subsidize wheat production. The first, a direct transfer payment out of the Federal treasury to those marketing wheat, was applied to the 1931 crop. Under the operations of the second Canadian Wheat Board, which was established in 1935, wheat producers were subsidized in some crop years since wheat was bought from them at a higher price than that for which it was ultimately sold. Since a part of this wheat was also sold for export at prices lower than those paid to the farmer, Canada was in effect subsidizing the export of wheat.

⁵ There is no doubt that the writings of Professor Schultz have led to a widespread recognition on this continent of the relevance of these three factors in explaining the relationship of agriculture to the rest of the economy. It is interesting therefore to find two of these three premises and the same conclusion sandwiched into one paragraph of Professor Allan Fisher (1):

"This population trend (*i.e.* from rural to urban areas) has been observed in so many countries with the widest variety of economic structure that it is difficult to believe that it can anywhere be adequately explained by reference to purely local conditions or local policy. Clearly the only satisfactory test for determining the optimum number of farmers in any country or in the world as a whole is their ability to supply the food and raw materials which the community needs. If anything happens to increase the efficiency of their production, the optimum number of farmers will diminish. After a certain rather low standard of income has been passed, the demand for food is not greatly stimulated by any fall in price which increased efficiency makes possible. People prefer rather to spend the money they save through getting food more cheaply on other things, on clothes, housing and other needs, familiar and unfamiliar, because happily, as Adam Smith pointed out long ago, the capacity of the human stomach is limited. There can be little doubt that improvements in agriculture have in fact made these changes in expenditure possible. The resources of science, advances in chemistry, botany, biology, bacteriology, have, during recent years, been directed on a quite unprecedented scale towards the improvement of farm methods throughout the world; there have been marked changes in the use of fertilizers, improvements in the quality of livestock, in seed selection and in scientific soil study, as well as in the application to farming of machinery and other improved implements. An accurate quantitative statement is difficult, or perhaps impossible, but the guess may safely be hazarded that during this generation the significance of new inventions affecting agriculture has been greater than the significance of any other set of new inventions. The inevitable consequence is that the world can now get all the food it needs with a relatively diminished expenditure of human effort, and some of the resources thus set free can be applied with advantage to the production of other things."

improving the welfare of farm and non-farm people alike there is no substitute for a high level of employment, not only in Canada, but in those countries with whom Canada trades. But since there is some doubt as to the ability of economists to devise and of governments to implement measures appropriate to attaining this objective we would do well to seek a second line of defence.

In fashioning an appropriate second line of defence a careful distinction must be drawn between the income and resource problems. The failure to distinguish analytically between these two concepts is almost certain to lead to the adoption of devices which, although intended to support farm income, almost always result in a diminution of total output. Efforts directed at improving the allocation of resources should not be confined to periods of depression. Indeed the greatest gain in making the fullest use of our human and material resources is perhaps made during periods of prosperity. Measures adopted specifically for their effect upon the allocation of resources may have either no effect or an adverse effect upon the allocation of income.

II

THE RESOURCE PROBLEM AND THE PRICE SYSTEM

Nevertheless since the income and resource problems are inextricably linked, let us first outline some of the measures which offer some promise of contributing to a solution of the resource problem. Although the price mechanism is not the sole, it is by far the most effective means of determining the allocation of resources. Economic theory has always placed emphasis upon the function of the price mechanism in achieving an optimum allocation of resources—that is, of most fully satisfying the desires of consumers as expressed by their dollar votes in the market place.

The necessary condition for this optimum allocation of resources is that the prices of factors be equal to their marginal value products and the marginal rates of substitution of products be equal to the ratio of their prices. Given this condition, firms and households, are, under the assumption of perfect competition, in a position of equilibrium. They cannot better themselves by any further adjustment to the economic variables which confront them nor, with given resources, can the total product be increased. The resource problem may then be defined as the divergence between any given allocation of resources and such an allocation as will satisfy these criteria of equilibrium under conditions of perfect competition. The implication is clear: If we are to control prices in such a way as to permit a full use of our resources and a rising standard of living, the criterion of price determination for any product must be that of equating supply and demand for that product over a period of time.

The primary function of prices is to so allocate resources as to best satisfy consumers' desires. *If a price system serves this end and serves it effectively, it can serve no other.* My thesis stands or falls on this proposition; for if it holds, we cannot afford to use the price system for the purpose of controlling the distribution of income.

Economic Progress

An effort has been made in framing the title of this paper to imply that any method which is used to support farm income should be consistent with economic progress. What do we mean by "economic progress"?

Economic progress is defined as change in the pattern of production in accordance with consumer preference and the continuous enlargement of total product. The most salient and persistent characteristic of our modern industrial structure is change. Nylon and rayon replace natural silk and cotton; gasoline replaces oats; the combine and mechanical grain-loader replace labour formerly applied on the end of pitch-forks and scoop shovels. As Professor Allan Fisher has said, "If the fruits of increased productive efficiency are to be enjoyed, there must be more or less continuous transfers of resources . . ." (2). If we are to permit a maximum of economic progress and to allow our productive equipment to be used for the production of those goods and services which we need most, the price system must serve this one master and it alone.

Any insistence upon the prime importance of the price mechanism as an allocator of resources should not imply that prices perform this function perfectly, nor that their operation cannot be improved by the application of specific controls. The problem of price uncertainty is a familiar one. It arises from the fact that, in a competitive market in which the relative prices of agricultural products are subject to wide variations, producers simply do not know at the time when they formulate their production plans, what prices they will receive for their products at the time these products are ready for market. Such lack of knowledge results in a misallocation of resources with consequent losses to both the individual farmer and to society as a whole. Much of the fanatical opposition on the part of organized grain producers in Western Canada to the operation of a free market for wheat may be attributed to the uncertainty which is characteristic of such a market.

Individual farmers have neither the information nor the technical facilities essential to the accurate formulation of price expectations for their products. They are, therefore, prone to place increasing reliance upon a selling monopoly, operated by either the government or themselves, which will announce a fixed minimum price prior to seeding- or breeding-time. If free markets for agricultural products are worth preserving, direct action on the part of the government could do much to reduce excessive price uncertainty. Forward pricing is a technique which would permit the reduction of such price uncertainty through the formulation of more accurate price expectations and the pooling of risk.

Forward Pricing

Some people are inclined to regard forward prices as a substitute for parity prices, that is, as another way of assuring farmers of a higher than equilibrium price for their products. This interpretation is quite erroneous. A forward price simply represents a price forecast coupled with a guarantee. The responsible pricing agency of the Dominion Department of Agriculture would, prior to the time of breeding or seeding, announce a minimum price for the products in question, effective at such time as these products are

ready for market. If the guaranteed forward price turns out to be higher than the market price the pricing agency makes up the difference to the farmer by a direct payment. If the market price exceeds the forward price the farmer is permitted to retain the whole of the market price.⁶

The pricing agency in fixing the forward price attempts to forecast the equilibrium price as closely as possible. That is, the forward price for barley, for example, would be fixed at a level which would call forth a volume of barley which could be moved into consumption at that price. The accuracy of the pricing agency's forecast would thus be subject to an objective check, *ex post*—*i.e.*, by the closeness of the forward price to the market price.

Although the forward pricing device is designed primarily to improve the allocation of resources it would also contribute something towards the improvement of farm income since it would enable farmers to adjust their pattern of production more closely to the output of those commodities which consumers desire and for which they are willing to pay.

Other techniques which would contribute to a solution of both the resource and income problems are a crop insurance and an ever-normal granary program. Crop insurance would partially iron out those year-to-year fluctuations in farm income which are attributable to variations in yield. An ever-normal granary would partially stabilize the prices of feed grains by eliminating most of that part of the variation in price which is attributable to the effect of yield variation on supply.

These techniques merit a much closer scrutiny than it is possible to accord to them here. That their use would pose important problems is readily admitted; the relevant question is whether such problems would prove more intractable than those presented by alternative avenues of approach.

III

THE FARM INCOME PROBLEM

This last section will be concerned with the income problem which confronts farm people, particularly, during the downswing of the business cycle. We have indicated that the resolution of the secular problem, presented by lower *per capita* returns to farm people, hinges largely upon a shift in the distribution of capital and labour between agriculture and other industries. Shifting labour out of agriculture is not the answer to cyclical unemployment since it is assumed, by definition, that the decline in demand is of a temporary nature. But during depressions

⁶ The failure on the part of the Government to recover the excess of the market price over the forward price will result in a subsidy to the farmer. Such a subsidy might be minimized by guaranteeing only, say, 90 per cent of the forward price. Any attempt upon the part of the Government to recover this differential is confronted by two important difficulties:

(a) *Economic.* Products which are themselves factors, *e.g.*, grains, will bring a net price to the farmer at the elevator which is lower than their market price. This lower price will encourage the farmer to feed more of such grains to livestock than their true value warrants. Suppose the market price for barley is \$1.00 and the forward price \$0.75 per bushel. It is then in the farmer's interest to feed barley so long as its marginal value product (as meat) exceeds \$0.75 per bushel. From the point of view of society, barley should be fed only if its marginal value product exceeds \$1.00 per bushel. A two-price system will not give an optimum allocation of resources. This is one of the most formidable and least recognized difficulties confronting the operation of a system of forward prices as proposed by Schultz and Johnson. Whenever a compensatory payment is made on a product which is also a factor the resource problem has been aggravated.

(b) *Administrative.* The forward pricing agency would probably be subjected to irresistible pressure by organized producer groups to fix forward prices, not at their most probable level, but somewhat higher, in order to minimize any possible excess of market over forward prices.

people in agriculture find themselves caught in the squeeze of falling prices for farm products and fairly stable prices for the industrial products which they have to buy. Such a squeeze may result in many families on farms earning less than a minimum, socially acceptable level of income. Under such circumstances transfer payments to such families may well be considered desirable.

Under a system of individual enterprise the primary distribution of income among members of the economic community is determined by the distribution of ownership of the factors of production—be they labour, land, or durable producers' goods—and the prices of these factors. There are no moral implications as to the manner in which the unfettered operation of a private enterprise economy distributes income. Those persons who are sufficiently shrewd as to be born to rich parents, or aggressive enough to acquire valuable factors, enjoy large incomes.

The income problem may be defined as the divergence of any given distribution of income among members of the political community from a distribution which satisfies certain democratic social welfare criteria (4). The state by common consent has assumed the right to influence the distribution of income among its members. On the one hand it employs the technique of direct and indirect taxation—progressive income and inheritance taxes, regressive sales taxes and discriminatory tariff and excise taxes. On the other hand it makes direct and indirect payments to members of the community by the use of such devices as family allowances, contributions to the Unemployment Insurance Fund, and to the Prairie Farm Assistance Fund.

Producers apparently have a strong preference for methods of supporting farm income which will raise the prices of agricultural products above their equilibrium level. Such a preference is evident in the current demands for parity prices. Subsidized prices are not a desirable means of supporting the income of persons on farms. In their crudest form, as parity prices, they block economic progress; in a more refined form, as proposed by Professor Schultz in his compensatory payments proposal⁷, they make transfer payments to those farmers who need them least.

Any effort sponsored by farm organizations or by governments to bolster agricultural prices through the restriction of output or the storage of durable farm products may transfer some of the burden to consumers but such a practice is not consistent with the general welfare. What is required is full production, not only by agriculture but by all industries.

Need for Income Supplement During Depressions

What we want essentially is a device which will guarantee to farmers during times of depression a minimum level of gross income which will permit them to hold their business together, to avoid heavy disinvestment in material and human resources and to maintain an acceptable minimum standard of living. Moreover, we want such a guarantee to become effective

⁷ Schultz' scheme of compensatory payments is to pay directly to farmers, during a depression, the difference, or some pre-determined portion of the difference, between the current market price and a floor price for their products. The compensatory price payments are to go into effect when unemployment has reached a specified level and to be discontinued either when the amount of unemployment becomes less than this maximum or when the market price of the product equals the established percentage of the pre-depression price.

Since Professor Schultz has been most insistent as to the desirability of divorcing income supports from the prices of farm products this proposal seems inconsistent.

tive only during periods of depression. If there is not sufficient demand for a product, even with a high level of employment, to enable those producing it to meet costs, we do not wish to subsidize such producers to continue producing this product. The market must still decide what goods are to be produced and by which firms; what we wish to avoid is a wholesale excision of reasonably efficient firms and the consequent depressed standard of living and capital losses which occur during a period of depressed prices.

Moreover, we wish to be able to single out those farm families whose earnings are not sufficient to permit them to maintain a minimum acceptable standard of living. If an individual, abiding by the established legal and moral rules of the game, is able to earn a large income, he may not be criticized for so doing. This is quite a different proposition, however, from making income support payments through the medium of government fiscal policy without regard to the recipient's income status.

The administrative machinery necessary to any selection of those farm families with low levels of net income already exists. The income tax is widely used as an instrument of fiscal policy. If it is appropriate to the task of redistributing income through a progressive tax on net income, why not use it as a basis for *payments* (negative taxes) to those whose income is considered undesirably low? A *negative income tax* is, therefore, suggested as an appropriate technique for supporting farm income during a depression by according different treatment to farm families with varying levels of *per capita* net income.

Negative Income Tax Proposal

Briefly the plan is to guarantee to all bona fide farmers, during periods of depression, a government payment equal to a fixed percentage of any deficit of their net farm income below a specified minimum, based upon the number of persons in the farm family. Suppose the minimum level of net income was fixed at \$500 for each member of the farm family resident on the farm. A family of four, living on a farm which yielded a net income of \$1,500 during the year would receive (say) 80 per cent of \$500 (\$2,000-\$1,500), or \$400.

The suggested minimum of \$500 per person is, of course, purely tentative as is the 80 per cent of the deficit. The purpose of paying only a percentage, rather than the whole of the deficit, is to avoid removing the incentive for families below the minimum net income to increase their own earnings.

The administrative difficulties which are likely to confront a scheme of this kind do not appear insuperable. If farm operators are to be assured of covering their operating expenses, the determination of what does and does not constitute operating expenses is of considerable importance. All current operating expenses connected with the operation of the farm should be allowable. These would include taxes, rent, wages, interest, feed and seed, fuel, twine, repairs and an allowance for depreciation on buildings and equipment. Capital expenditures generally would be excluded although the interest on such outlays should be considered a legitimate item of current operating expenses. Purchases of additional land, new machinery or the materials for new buildings, or additions to present ones, would not

be allowable under this provision, both to forestall uneconomic investment in this type of capital outlay and to prevent heavy transfer payments to people in agriculture.

The proposal that a farmer should be guaranteed his current operating expenses during a period of depression is subject to one important difficulty. If an operator knows that his gross receipts will not be sufficiently high to meet operating expenses and still provide the minimum specified level of net income he will not be concerned with the size of his total outlay on factors of production. This difficulty might be circumvented by allowing the farmer to charge not more than the total of his operating expenses for the year preceding the onset of the depression. Moreover, since the price of some factors, such as labour, may change fairly rapidly, his expenses for the last pre-depression year might be deflated by a current index of the cost of goods and services used by farmers. A farmer's expense allowance might not, then, exceed a specified maximum, irrespective of his current farm operating expenses. Under these circumstances it would be to his advantage not to incur any increment of expenditure above this ceiling unless the most probable value of his expected increment of receipts was at least as great. The practice of making up only a percentage of the deficit of net farm income below the per caput minimum would also act as an incentive to farmers to equate marginal costs with marginal revenues.

In defining gross income several modifications to present income tax procedures appear necessary:

(a) Changes in the inventory of farm products should be included in income. Otherwise some farmers would be able to make themselves eligible for payments by accumulating inventories of grain or livestock.

(b) The income in kind which the farm contributes to family living, such as foods and use of house, should not be included in gross income owing to the difficulty of enforcing such a provision.

(c) If any member of the farm family employed on the farm received as wages more than the minimum allowance of net income (\$500 in our example) he would not qualify as a member of the family in computing the income payment.

Income from non-farm sources accruing to the farm family should be included in gross income as is now done.

When Should the Plan be Operative?

Professor Schultz has suggested that the thermostat which controls his plan of compensatory payments should be hooked to an index of employment. The purpose of this provision is to ensure that his income support scheme should be operative only during periods of depression. To guarantee all farmers their operating expenses, irrespective of the level of employment, would destroy the effectiveness of the price system as a guide to production. The objective of both his proposal and that under consideration here is to devise a plan to support farm income in the event other measures designed to maintain a high level of employment in the economy as a whole are ineffective.

One rather serious objection which might be raised to this method of determining when the plan should and should not be operative arises. It is possible that even with a high level of employment in the domestic economy the prices of such export staples as wheat, bacon, apples, cheese and beef may decline to such an extent as to cause a low income to firms

specializing in any one of these products. It might be suggested, therefore, that a plan to maintain a minimum level of farm income for all farms should be instituted whenever the price of any single product declines.

To institute an income support plan which is based on the price of individual farm products is one of the surest ways to block economic progress by obstructing necessary structural adjustments. The change in the demand for any product is all too likely to be of a secular rather than a cyclical nature. To maintain returns to the producer of a product which has suffered a structural decline in demand discourages a needed shift of resources to other uses. A large crop of a perishable product, like potatoes, will lower the price of potatoes, although the net return to producers may actually be larger than for an average size crop. A price support for potatoes under such conditions is difficult to justify. The dangers inherent in a system of supporting farm income which is based upon the performance of agriculture itself are formidable indeed. Finally the high degree of correlation which exists between the level of domestic employment and the level of export demand suggests that the former may prove to be a satisfactory index to which to tie an income support plan.

The further objection may be raised that an income support plan of this nature would tend to block the desirable movement of surplus farm people off the farm. The validity of such an objection depends largely upon the measures which are used to alleviate the impact of unemployment in the non-farm sector of the economy as well as upon the severity of the depression itself. If the economy operates during any reasonable proportion of the time at a level of employment which is above the critical point at which this plan becomes operative, many farm people will still find ample incentive either to move to better paying occupations or to acquire a more productive combination of resources.

A more serious limiting factor arises from the fact that, so far, we have not been able to devise and apply economic techniques which will iron out the severe fluctuations in the net incomes of individual farmers arising from weather-induced fluctuations in yield. Farmers on submarginal land receive relief payments and transfer payments under the Prairie Farm Assistance Act, which payments probably become partly capitalized in the value of the land itself. In the absence of a universal crop insurance program the application of a negative income tax plan might result in rather large payments being made to farmers suffering crop failure while the plan was in effect. Other members of the economic community should not be called upon periodically to bail out those farmers who have crop failures while these same farmers pocket the receipts from above average crops.

In conclusion, then, the most substantial merits of a negative income tax as a means of supporting farm income are the following:

(a) It would tie payments to the human agent, *i.e.*, to the farm family, rather than to either the prices of farm products or to the factors of production used on the farm.

(b) Payments would be non-regressive and would go to those farm people who needed them most.

(c) The plan would not interfere with either the domestic or export trade in farm products.

(d) The adoption of a specific plan might tend to discourage periodic raids on Ottawa by large organized groups of producers seeking uneconomic price supports for their product.

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Dr. Burton's paper deals with the phenomena of the general depression. During the depression phase of the business cycle, the outstanding and peculiar characteristic of agriculture is the maintenance of production. Low prices do not lead to a contraction of production; if anything, production is increased. It cannot therefore be argued that maintenance of prices would lead to expansion of production, and distortion of resources.

During depression, farm incomes might be supported either (a) directly in relation to some rough measure of need, e.g., through the negative income tax proposal outlined in Dr. Burton's paper; (b) indirectly through the support of prices of agricultural products, e.g., through compensatory payments.

Dr. Burton prefers the first method, because he does not think that the community as a whole will be willing to support a system of payments which will vary directly with the revenue already being secured by the farmer through the sale of his product. This may be so. However, in terms of the use of resources there are one or two points which seem to deserve further consideration, before we decide in favour of a system of payments based on needs.

There is some distortion in the use of resources in agriculture during a period of general depression.

Advantages of Price Support

First, when farm incomes fall farm demand declines, with significant effect on industry. The more closely farm income, and the distribution of farm income, is kept in line with pre-depression conditions, the less the disturbance caused by changes in farm demand. In this connection, support through product prices would seem to be preferable to support on the basis of need.

Second, during a period of depression there is considerable disinvestment in agriculture. Land deteriorates and equipment is not maintained. It seems reasonable to suppose that the method of support through prices, which would maintain incomes in closer relation to pre-depression incomes, would be more effective in preventing disinvestment on the individual farm, than would the alternative method of support on the basis of need.

Third, there is considerable excess labour input in agriculture during depression. The rural-urban migration is checked, labour moves from the city to farms, and women and children are employed in farm work. It seems probable that payments based on family need would accentuate this tendency.

¹ Delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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Utopias are generally a long piece away; and if I were to criticize Professor Burton's proposal, it would have to be on the ground that as a proposal it partakes rather more of theory than of practicality. This is true, I believe, whether Professor Burton intends his proposal to include the negative income tax only, or the other techniques as well, to which he has favourably referred. It seems to me that he must mean to include all of them, or substantially so at least, because the negative income tax proposal alone could only contribute to economic progress to the extent that it would maintain, at a minimum level, the incomes of those farmers who habitually receive, in times of depression, incomes below the minimum level. If by depression Professor Burton should mean periods of crop failure as well, then in all likelihood the negative income tax proposal would also include many other farmers suffering drastically reduced incomes. Since, however, it is proposed to tie this part of the plan to the level of employment within the national economy, ordinary crop failures at least would seem to be excluded.

This being accepted, Professor Burton fails to suggest the manner in which other segments of the farm economy would be benefited by this proposal. In his introductory statement he does suggest it as a means of "according different treatment to farm families with varying levels of *per capita* net income"; but fails to elucidate the variable technique. Of course, it would be quite possible to accord different treatment to farmers with different levels of income, but how to do so and at the same time continue economic progress in time of depression escapes me, especially if at the same time the plan is to be non-regressive. As a means of maintaining a minimum level of farm income for all farm families, I can, of course, concede the plausibility of the theory.

Practicability is, however, a different matter. Of the four merits which Professor Burton lists for the proposal, I can concede only two—the first and third. The second I have already questioned on the basis of a non-regressive plan consistent with economic progress, which progress the author has defined as "change in the pattern of production in accordance with consumer preference and the continuous enlargement of total product". The fourth merit, that of discouraging periodic raids on Ottawa by organized groups of producers, might indeed become a mere case of substitution. The new type of raid might very well be for the complete abolition and obliteration of all farm economists, and especially the originator of the plan.

Farmers and Income Tax Returns

Personally, I should deplore this action; but if the plan proposed to force every Canadian farmer hoping to benefit from it to make out an income tax return, and for this purpose to keep an accurate set of books on an inventory basis throughout the year, I should be grieved, but not surprised, at any unfortunate consequences. If it is correct (as stated by the Minister of Agriculture for the Dominion) that for 1946 not more than seven per cent of farmers were assessable for income tax, then in time of depression at least 90 per cent of more than 700,000 Canadian farmers would be compelled to go through this onerous procedure if they hoped to qualify on the basis of the \$500-income, exclusive of income in kind, suggested for purposes of illustration by Professor Burton.

Actually, the situation would be even more extreme than this. If only 90 per cent of the farmers of Canada were eligible for application for transfer funds of this character, then the Government could rightly conclude that the remaining ten per cent were assessable for income tax; and if the Government showed any reluctance to engage a sufficient number of assessors, the non-farm population could be trusted to remove this reluctance. In this event, the assessable farmers also would be after Professor Burton in large numbers, if there were anything left of him by this time.

I do not know whether Professor Burton envisions a duplication of income returns, one to the Department of National Revenue and another to the Department of Agriculture. If not, the tie-up with income tax is guaranteed. If so, his fate is sealed. It is conceivable that the Canadian farmer might be educated, over a long period, to this method of securing a part of his living, but my guess is that it would take more time than we have, if Messrs. Dewy and Dakin⁴ are right when they strongly suggest that the bottom of the decline in the current 54-year cycle will be reached in the early fifties. If it takes farmers twenty years to bring an important new piece of equipment into general use, how long will it take to bring into complete use a system of farm bookkeeping satisfactory to the Auditor-General of Canada?

Leaving this interesting speculation on the prospect of Professor Burton's early demise, I have only a word to say with regard to his discussion of forward prices. Even if I considered myself as well qualified as any other, I should certainly hesitate long and engage

³ Associate Editor.⁴ DEWEY, E. R. and E. F. DAKIN. *Cycles, The Science of Prediction*. Henry Holt, New York. 1947.

mightily in prayer before accepting the responsibility of setting the equilibrium price for any single Canadian farm product; and if I were the responsible Minister, I should know that my political life would be both short and merry, if I undertook a triple gamble, fifteen to thirty months in advance, on what the farmer, the weather and the open market combined could do to me. We have, during the war and since, become accustomed to several different kinds of forward pricing. On the whole, the experiments have been reasonably satisfactory. There have, however, been enough examples of failure or partial failure to warrant extreme dubiety in the instance of so precise a matter as equilibrium pricing.

THE DEVELOPMENT AND USE OF PRODUCTION FUNCTIONS FOR FIRMS IN AGRICULTURE¹

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The researcher in agricultural economics, or more particularly in that select part of agricultural economics called "farm management", has always placed a great deal of emphasis upon the input-output analysis. Using what has now become the standard procedure, namely, the cross-classification technique³, he has attempted to define the relation that exists between the inputs of factors and the output of products within the farm. The purpose of this paper is to examine another technique that is available for the same kind of problems. We shall be concerned with a multiple correlation production function analysis. The discussion is divided into three parts: *first*, a general statement of the technique; *second*, the application of the technique to a specific problem; and *third*, the limitations of the technique.

I. THE TECHNIQUE

A production function is a mathematical statement of the relation between a dependent variable (*output*) and an independent variable (or any number of independent) variables (*inputs*). It describes the relation that exists between factors and products when certain assumptions about the variables in the system are made. The extent of the function is determined primarily by the nature of the process, and by the measurability of the variables. To take a very simple example: Suppose we have two variables, seed and yield, in the business of producing wheat, and we wish to determine the relation between input and product from a given piece of land. Table 1 and Figure 1 illustrate one possible solution to the problem.

TABLE 1.—THE TOTAL PRODUCTION OF WHEAT WITH VARIABLE QUANTITIES OF SEED AND A FIXED QUANTITY OF LAND

Inputs of seed	Total product	Average product	Marginal product*
0.5	4	8	—
1.0	12	12	8
1.5	17	11.3	5
2.0	20	10.0	3
2.5	21	8.4	1
3.0	22	7.3	1
3.5	23	6.6	1
4.0	24	6.0	1
4.5	22	4.9	-2

* This is only an approximation to the marginal product.

In the graph, the line AB is a production function, and from its shape (determined *a priori*) and its position (fixed by the coefficients of the equation) we can determine the "best" rate of seeding. Introducing the

¹ A paper delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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³ For a recent example of the use of this technique to illustrate an input-output relation see Patterson (2).

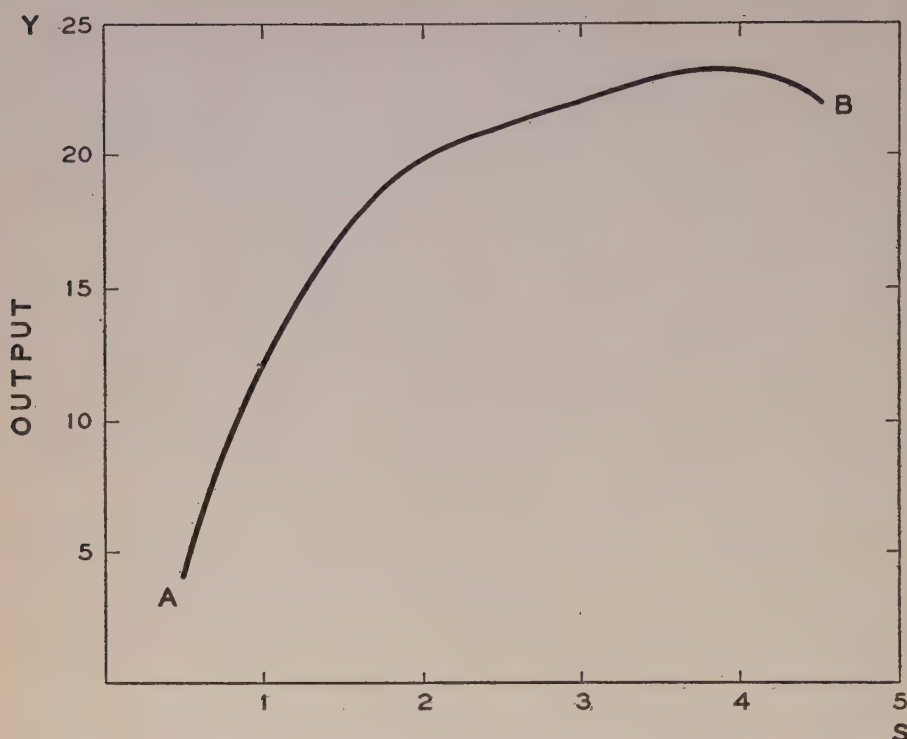


FIGURE 1. The productivity of a given quantity of land when variable quantities of seed are applied.

price element we would find that the optimum point of input occurs where $\frac{dY}{dS}$ equals $\frac{pS}{pY}$; or where we have tangency between the price line and the production function (4).

Two important selections must be made when we derive a production function. First we must select the function most likely to "fit"⁴ the data, and second, we must select the important variables. Economic theory⁵ and a knowledge of the production process will usually allow us to make a reasonable choice of the possible functions; each of which may be fitted and the best one used. That is, we may decide that a linear function is the best approximation to the series (*i.e.*, that there are constant returns to scale) and if it did not give a satisfactory correlation we might next try a second degree curve. We would proceed in this fashion until we felt satisfied (by reference to the coefficients) that our function was the "best" obtainable for the data.

The selection of the variables offers a more complex problem. In the example used above, we dealt with only two variables—the dependent variable yield, and the independent variable seed. From a practical standpoint there are obviously other variables, particularly on the right-hand side of the equation, that must be considered. On the output side, if we are

⁴ The fit may be described by the correlation coefficient.

⁵ Economic theory suggests for example that diminishing returns to scale, will be a factor in "fit".

dealing with only a single product, its commercial measure of quantity will suffice; with a multi-product enterprise the total production, reduced to a common denominator such as dollars, will give us an acceptable standard; in either case we have just one variable. However, with the independent variables—and an independent variable is a factor which contributes in a separate and distinct (unrelated) fashion to output—we must deal with a whole host of items. These may be broadly classified as “economic” and “non-economic”. We attempt to isolate all the “non-economic” items and hold them constant, working only with those measurable economic forces which can be included in an equation of manageable size. For example, non-economic things such as sunlight, moisture, insects, and soil condition, will have an important bearing upon the amount of wheat that will be produced with a given combination of other factors, but we do not include measures of these variations in our production function. We hold these variables as parameters and discuss such factors as machinery input, labour, fuel, and so forth. We select all the important “economic” factors which contribute to output; combine those which are not independent⁶; discard those which are constant in the particular situation that we are discussing; and bring the resulting selection into an equation.

II. THE APPLICATION OF THE TECHNIQUE

We shall use data gathered by the Dominion Economics Division⁷ in the Eyebrow-Lacenda section of Saskatchewan to illustrate the technique. The Division has compiled a record of 450 farm businesses for the year ending April 30, 1940. As each record gives a complete picture of the farm operation for that year we have all the information necessary to derive a production function. Our problem is to find the relation that exists between income and expense as the size of the business increases. We want to get a picture, like the one in our previous graph, which shows how much output increases with each increment of input. We also wish to estimate the marginal productivities of the factors.

In order to keep the “non-economic” variables constant, we have confined ourselves to one particular geographical area (in the belief that the variations in climate and so forth will be very minor); for the same reason (to eliminate variations with which we are not dealing) we selected a sample of farms from one particular Land Class⁸. Even farms within the same Land Class may be “off type”, so we made a further selection by choosing only those farms which get most of their income from wheat, and which use the same production techniques.

Our sample consists of 194 farms situated in Land Class III. After running simple correlations on the variables we have selected five

⁶ From general observation, some variables are highly correlated, *e.g.*, tractors and combines (other than self-propelled) in harvesting operations. We can also estimate independence statistically—by computing simple correlation coefficients between the various inputs—and combine those which are used in fixed proportions.

⁷ The author wishes to express his sincere thanks to Dr. C. C. Spence, Economics Division, Dominion Department of Agriculture, Edmonton, for making these data available.

⁸ Briefly stated, the classification consists of appraising each quarter-section of land as a wheat producing area in the light of all relevant physical and economic information available—the greatest weight being given to the past productivity of such land. The economic significance of the classification rests on the relation the expected income from a quarter-section of land in any one of the land classes bears to the expected income from a quarter-section of land which is “at the margin for wheat production”. The latter is termed Land Class II.

independent measures of input⁹. These, together with the dependent variable (measured in dollars), give us a working equation with six variables. We use as our regression equations two functions: (a) a linear multiple correlation analysis, and (b) a function which is linear in the logarithms.

Using a standard correlation analysis (3) the correlation coefficient for the linear function is 0.88¹⁰. The adjusted coefficient of multiple determination is 0.76. This latter coefficient shows the percentage of the variance in the dependent variable which on the average is associated with the independent variables. Thus for the 194 farms included in the sample, approximately 76 per cent of the variation in output is "explained" by the factors included in the analysis¹¹. The regression coefficients for the various factors are:

Real estate	0.0448	Significant at the 1% level
Livestock	0.2344	Significant at the 5% level
Machinery	0.3588	Significant at the 1% level
Labour	15.8279	Significant at the 5% level
Cash expense	1.9218	Significant at the 1% level

The regression (or estimation) equation is:

$$X_c = 471 + 0.045 A + 0.234 B + 0.359 C + 15.823 D + 1.922 E$$

Where: A = Real estate investment,
B = Livestock investment,
C = Machinery investment,
D = Labour,
E = Cash expense.

Using a function which is linear in the logarithms¹² we get a highly significant correlation coefficient with a value of 0.85; and a coefficient of multiple determination of 0.72.

The regression coefficients are:

Real estate	0.18	Significant at the 1% level
Livestock	-0.03	not significant
Machinery	0.18	Significant at the 1% level
Labour	0.06	not significant
Cash expense	0.75	Significant at the 1% level

The regression equation is:

$$\log X_c = 0.04 + 0.18 \log A - 0.03 \log B \\ + 0.18 \log C + 0.06 \log D + 0.75 \log E$$

As we noted in a previous footnote the regression coefficient gives us the marginal productivity of the factor at the geometric mean. This relationship can be plotted for any particular factor when the other independent variables are held constant. Figure 2 illustrates this.

⁹ These five measures are: the average real estate investment—a simple average of the beginning and ending year inventory; the average livestock investment—calculated as with real estate; the average machinery investment—the farmers' figures are taken as the year end value and by use of a table we calculate depreciation expense; this figure less the cost of repairs, is added to the year end value to obtain the opening inventory. A simple average then gives us the figure for the variable. Months of labour—family labour, plus hired labour, plus operators' labour. Cash expenses—include the items for which a cash outlay was made during the year.

¹⁰ This figure is highly significant. That is to say it is very unlikely (probability less than 1%) that it could have arisen by chance if the true correlation coefficients in the hypothetical population were zero.

¹¹ We assume that the marginal productivity is constant while the elasticity of the factor varies.

¹² This is the function used by Paul H. Douglas (1). It has recently been applied by Tintner to farm record data (5). In this note Tintner states his reason for using this function: "1) It gives immediately elasticities of the product with respect to the factors of production (Paul H. Douglas called them flexibilities). That is, we get answers to the question: By how many per cent will the product increase on the average if the given factor increases by one per cent? Elasticities are dimensionless numbers and independent of the units of measurement. 2) Our form of the production function permits the phenomenon of decreasing marginal returns to come into evidence without using too many degrees of freedom. This would not be possible if we should fit a linear function to our data as such, without using the logarithms. If we should use, on the other hand, a quadratic function we could get decreasing returns. But such a function would necessitate more than twice as many regression coefficients and hence substantially diminish the number of degrees of freedom. 3) If the errors in the data are small and normally distributed, a logarithmic transformation of our variables will preserve the normality to a substantial degree, as can be seen from the Taylor development of the logarithm. But even if the errors are not normally distributed and not independent we shall still get the best linear estimate in a certain sense by the application of the method of least squares. Tests of significance, however, are no longer valid. 4) We believe that Douglas and his associates have amply demonstrated the usefulness of his particular approach in spite of some criticism."

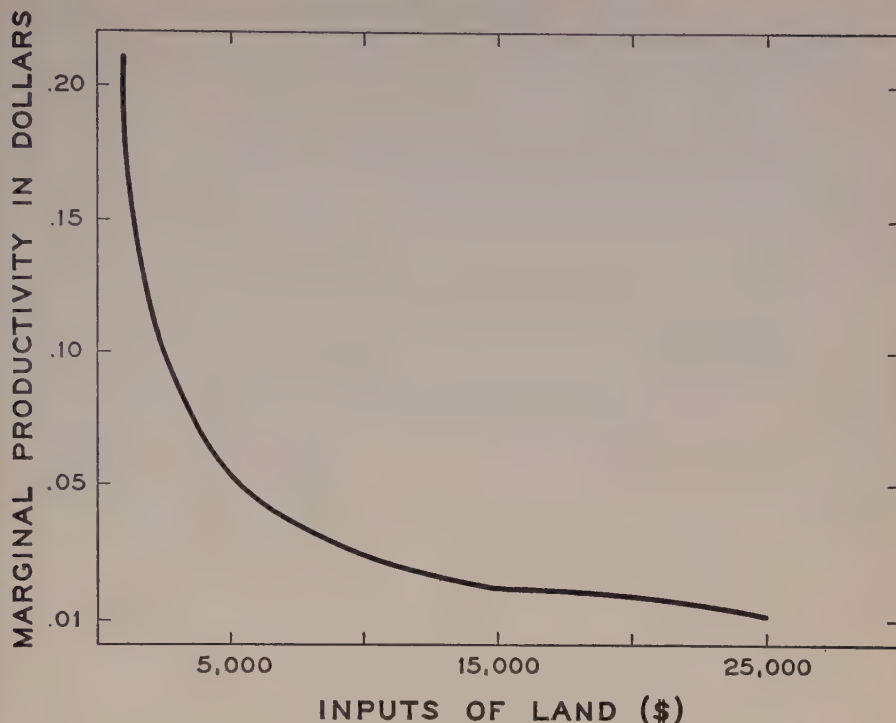


FIGURE 2. The marginal productivity of increasing amounts of land. (Other factors held constant at their geometric mean).

Before we consider the limitations of the technique, a comment or two, by way of summary, may be in order. Both of the functions that we have derived give us the input-output relation for the sample of farms. The logarithmic function has the added advantage of giving the marginal productivities of the factors. The fact that there are significant differences between the value to be attached to the several factors is forcibly brought to our attention. It is also obvious that the average size of farm in the sample is much below the optimum¹³. Unlike the cross-classification technique (which is really a crude form of scatter diagram showing the existence of relations but not measuring them) this method gives us quantitative values for some important variables in the business of producing wheat in the Eyebrow-Lacadena area.¹⁴

III. THE LIMITATIONS OF THE TECHNIQUE

The first limitation to which we must draw attention is the static nature of the analysis. All economic research to-day suffers from the lack of useful dynamic techniques, but in most fields at least an effort is being made to remedy the situation. In agricultural economics, however, we seem all too ready to let the purist in the general sphere do the worrying, while we repeat the well-worn exercises of pre-World War I vintage.

¹³ We must remember, however, that this is a static analysis and the results pertain to only one year; risk and uncertainty go unheeded.

¹⁴ We can also relate this discussion to the "principles" of farm management. These are: (a) size of business; (b) diversity of business; (c) efficiency in the use of factors; (d) rates of production; (e) relative prices of products.

Production function analysis may open the way to a solution inasmuch as we can date the variables; it is doubtful if any other techniques offer this hope.

We have made several assumptions in the course of our analysis which may bear mention. A thing many forget, particularly the younger men, is that once the basic assumption is stated, the maintenance of internal consistency will bring the desired result as a conclusion. The valuation of any particular proposition therefore depends not on the logical demonstration but upon the relevance or irrelevance of the underlying assumption. Underlying all analysis of cost is the assumption that cost may be expressed¹⁵ as some function of the various contributing factors. If we use just one function to express the relation between cost and output (for example) on a number of farms, we assume that the production function for each farm is the same as the production function for the group (the interfirm-intrafirm relation is homogeneous). Further, if the marginal analysis is to be used we make the assumption that the various factors are divisible and substitutable. These are four of the basic assumptions used in this paper and it is well to keep them in mind when the results are considered.

Management is not included in our analysis. If each farm is regarded as unique, or as a management complex which functions only as an integrated whole whose destinies are guided by the entrepreneur and whose total output is primarily a function of his peculiar talent, we would of course have serious reservations about the efficacy of our analysis. On the other hand, if we conceive management to be simply a co-ordinating unit (a timing mechanism) we need not be much concerned about its omission from this particular situation. The co-ordinating and timing activities in wheat farming must of necessity be limited because they are encompassed by the dictates of ecological factors.

We have already discussed the statistical problem of selecting the variables but mention should also be made of two related questions. The first of these concerns the imputation of causality. When we derive a function we get a statement of the relations between the variables. The natural thing to do then is to attempt to attribute causes to particular relations. This may be quite acceptable, but the thing to be kept in mind is that the statistical work done does not in any manner give us a "scientific" means for detecting causes. One of the limitations of the method is the fact that it measures relations; it does not have anything to say about causes. The second point has to do with the stochastic elements in the equation. We have seen in our analysis that some 20 per cent of the variability is "unexplained". From a statistical standpoint this would be relatively insignificant, but from an economic view it may be of particular concern inasmuch as it hides or disguises the true relation. That is, the significant variability may occur within the "unexplained residuals". Whether such is the case must be decided on consideration of the data used to derive the function; but in any case if the stochastic elements are large we must be very careful about the kind of conclusions drawn from the analysis.

¹⁵ As the expression is mathematical the illusion of exactness and objectivity that inevitably accompanies a numerical technique has a tendency to lead us down the "primrose path".

The final limitation that should be mentioned is one not endogenous to this particular technique but common to most. The conclusions that can be drawn from any analysis are only as good as the data with which we start. Some forget this, and insist on trying to build a skyscraper with one brick. Then again, too frequently we get lost in methodology and a maze of coefficients; we sacrifice common sense for symbolism, and thereby hope to cover up deficiencies of thought. These are potent limitations.

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DISCUSSION¹

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Any discussion of the use of the production function technique in its application to agricultural production analysis should follow at least along two lines: *First*, the mathematical aspect as it applies to agriculture; and *second*, the use of this technique in the analysis.

The production function technique was made prominent by Professor Paul H. Douglas and his associates (2, 3, 4). Douglas developed the method and applied it in connection with production in manufacturing industries and especially in its application to the productivity of labour. It may be suggested that the fundamental mathematical approach and statistical techniques were developed for this particular purpose and may not be applicable to an industry like agriculture where the analysis involves several production functions, where joint relationships exist and where the influence of any one factor may be submerged or over-emphasized by deficiencies in the mechanics of the method. It is not my intention to deal with the mathematical phase of this method but to leave it to the statisticians. For the time being, I am prepared to accept the adequacy of it in view of the fact that competent agricultural statisticians are applying it to agriculture and seem satisfied that it is adequate within certain limitations, some of which have been pointed out by Mr. Harries. It is with respect to the use of the production function technique that I wish to make my main comments.

The use of this technique in dealing with the economics of agricultural production must be accepted as another step forward in the search by workers in farm management for tools of analysis necessary in the determination of the relationships that exist between the various agricultural productive factors and output. Tintner (6), Brownlee (1), and Heady (5), all of Iowa, have done considerable work in this direction and we are indeed grateful to Mr. Harries for bringing the method to our attention here.

A major objective in farm management research is to determine the relationships that exist between the various productive factors both as between themselves and in their contribution to the net income of the farm. Bearing in mind that economic factors of production are limited, it becomes a question of maximizing the product through the most efficient combination of these productive agents. This involves a determination of the marginal productivities of the contributing factors to the total product so that in the use of them no waste of any one is incurred. In practical language it is a question of how much land, equipment, labour, supplies, and so forth should be used and how much of each to insure the greatest total output of crops or livestock products which at the price will result in the largest net return to the producer.

¹ Delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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In our farm management work to date we have attempted to determine this by studying entire groups of farm units and drawing conclusions from the overall averages observed. While this presented a relatively good description of the over-all farm organization it was not possible to determine which factors were most responsible for the final results. In other words, it was difficult to state whether it was the investment in land, or the greater expenditure on labour, or the greater use of machinery, that contributed to the returns as observed. The use of cross-classification technique aids considerably in establishing relationships between inputs and output. But we need to go farther than that. We want to know as far as possible for each factor what is its marginal productivity so that in combining these factors we may approach what Professor G. W. Forster (7) refers to as the point of equimarginal returns. I believe that the most important feature of the production function technique is the manner in which the marginal productivities of the various factors can be measured quantitatively.

Mr. Harries has given us the method, has applied it to a specific problem and has outlined the limitations of the method. His advice for caution is timely and noteworthy.

The technique as described by Mr. Harries can be used in farm management analysis for many of our types of farms since it applies to the farm unit as a firm. However, it becomes questionable whether it is applicable to all production functions on every farm or whether it will serve the desired purpose in the case of highly specialized, commercial farms. As we move away in agriculture from the position of self-sufficiency and approach more closely to the status of commercial farming we modify to a considerable degree the influence of the dependent relationship between the various factors of production. It becomes more a matter of the efficiencies of individual operations rather than a combination of factors for the farm as a unit.

Specialization in agricultural production has proceeded for years on this continent and has been accelerated during the war. As a result of this process I believe we need to change our concept of the traditional farm as an indivisible organization.

Certain operations formerly associated with the farm owner-operator are being performed by other agencies. Marketing is one of them. Investment in land is another. The recent development of chemical weed control methods still another. On fruit and poultry farms many of the operations are not performed by the farm operator. Furthermore, certain tasks are performed on the farm by operating units which are independent of units used for other tasks. For example harvesting is done by a technical unit which is frequently unrelated to the size of the farm and mainly independent of any other farm operation.

This situation exists in greater or lesser degree on our different types of farms, but it may be suggested that, with the greater mechanization and the larger funds required to capitalize a modern farm, more of the production operations may be performed by agencies separate and apart from the farm unit. In such a situation we should modify our approach so that we make the individual function the primary point of analysis. It may be a matter of determining the "best" technical unit rather than the best combination of all the productive factors at the command of the farmer.

Whatever the trend in farm organization may be, the technique outlined by Mr. Harries is interesting and has definite possibilities in respect to the handling of problems in farm management. It is a functional approach and logically succeeds the descriptive method followed by workers in farm management for years.

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At the outset, I wish to congratulate Mr. Harries on an able presentation of a very difficult subject. I welcome any light that may be thrown on the problem of proportioning the factors of production in agriculture. This is one of the most difficult phases of research in farm management. Mr. Harries has done a good job of presenting the limitations to this method of approach. I have little further to add concerning the limitations mentioned. He has pointed out that many assumptions must be made and that the choice of variables must necessarily be arbitrary. The final results and the interpretation are affected by the decisions made at the beginning. He points out that the original data could be improved and the assumptions corrected over a period of time and thus become more reliable.

There is a limitation to the use of any correlation analysis in farm management data that was not mentioned specifically and to which I would like to direct your attention for a moment. It has long been known that there are many joint relationships in farm management data. A simple illustration in nature would be sunshine and temperature. When one increases, normally, the other does also and their effect on plant growth tends to be a "joint" relationship. There are many joint relationships in farm management. Taking the factors used by Mr. Harries, for example, there tends to be a strong joint relationship between acres of land or "real estate" and labour efficiency. It is also jointly related to a lesser degree to some phase of each of the other factors used in the equation. The correlation analysis operates on the basis of mathematically eliminating any relationship of independent variables other than the one to be measured. However, if a joint relation exists and one of the factors is thus held constant, the effect of the other independent variable will also be held constant to the extent that a joint relationship between them exists. I suspect that much of the approximately 20 per cent of unexplained variability of the dependent variable was, in reality, due to joint relationships. On the other hand, there is a strong possibility that some of the correlations are shown too high because of a joint relationship with some third factor not considered. A simple illustration of this would be a high correlation between the softness of asphalt pavement and infant mortality. There is no causal relation between them, but both may be jointly related to temperature and affected by it.

Historical Development

It is incorrect to infer that correlation analysis is new to the field of farm management. It was extensively used before 1930. Its lesser use in recent years has been due first to a realization that its findings are likely to be somewhat unreliable in a field where joint relationships are so common as in farm management. That danger is increased since the mechanics of the method require considerable concentration on the mathematics, as distinct from the logic of the process. The second reason for its disuse has been the difficulty of interpreting and applying its findings. The unit of production in agriculture is still a farm and the final decisions concerning production are made by farm operators. If our analysis is to be translated into action it must be correct, not only for a group; it must be correct for a farm, and it must be presented in terms that require something less than a Ph.D. to interpret them.

While there are very serious limits to reliance on multiple or secondary correlation analysis in farm management, I believe that in a field as difficult as production functions, we should encourage the development of any method which offers some hope of measuring the functions and expressing them in a single figure, if only as a rough indicator for research workers.

I do not share Mr. Harries' desire to have a method that can be used to register changes frequently. Changes in balances of land, labour and capital goods on a farm cannot be brought about easily or rapidly. Changes in balance, therefore, should not be encouraged as a result of short time changes in economic conditions. It would be better still if the most desirable input-output balance could be determined in terms of physical quantities. They would be the least subject to change and could serve as a semi-permanent guide.

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THE ECONOMICS AND STATISTICS WORK OF FAO¹

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Most public discussion of FAO's activities has centered around the agency's so-called proposed "action programs". Determination of these programs requires much detailed economic and statistical research and appraisal which seldom draws outside attention. It is in this practical realm that many of the FAO staff are now engaged in the day-to-day job of building a permanent international body for research and analysis in the fields of food and agriculture. Since this will include projects of vital interest to the agricultural economist and statistician, this paper is devoted to a consideration of the economics and statistics work of FAO, and the significance of this work in implementing the Organization's general aims.

GENERAL OBJECTIVES

Problems of world food and agriculture are so urgent that the mode of operations of the Economics and Statistics staff of FAO might well be described in some words attributed to a French General: "To hell with the principles; let's get on with the problem."³ As far as world food and agriculture are concerned, the fundamental problem is clear. Economists, other scientists and policy-making officials agree on the fact that improved food production, distribution and nutritional intake, along with more adequate clothing, housing and education, are essential to any long-range betterment of man's condition. Producers must be given the assurance of relatively stable prices and markets to avert the periodic slumps in income so traditionally experienced by wheat farmers and growers of other primary products. Better diets for consumers must be achieved at prices they can afford to pay for nutritionally desirable foods. These goals must be achieved as far as possible through existing economic machinery, using prices as the "stop" and "go" lights by which long-term production and utilization of resources are regulated.

Through a long series of international conferences, ranging from Hot Springs to the first annual meeting of the International Federation of Agricultural Producers, held recently in the Netherlands, agreement has persisted that the world food problem must be considered in concrete terms of economics and trade, on a world basis. Only an international organization, equipped to gather and analyse a vast range of basic information concerning food and agricultural problems and policies in all nations, can manage this task. Such an agency must continually study, for example, fluctuations in supplies of human food and animal feed crops and the reactions of those upon prices (and conversely, the effects of prices upon future supplies). It must possess many other facts relating to matters of production and distribution, and the world-wide existence of hunger and malnutrition.

¹ A paper delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

² Chief.

³ Usually attributed to General DeMalny (1740-1840).

This world food and agricultural agency must be in a position to assist the various governments in fitting their own programs into a world pattern designed to improve the position of all producers and consumers. It should be able to co-operate with other international agencies on the many inter-related aspects of the food and agricultural problems. In brief, its economic and statistical activities must inevitably form the very core of its policies. As the Hot Springs Conference agreed, "... the collection and exchange of economic data regarding food and agriculture everywhere is one of the first and most fundamental steps that needs to be taken. An agency with this function [will] furnish the facts on which intelligent international planning [can] be based" (1).

ORGANIZATION AND RESPONSIBILITIES OF ECONOMICS AND STATISTICS DIVISION OF FAO

At Quebec, in October, 1945, the Organization came into existence with the signing of the Constitution. During its brief lifetime, FAO has already taken important strides toward the eventual formulation of a world food and agriculture program. How has it done so, and what influence on food and agriculture production, movement, and prices may the agency be expected to have in the future?

A partial answer to these questions can be found in the Organization's Constitution which specifies among other matters that FAO shall, "... collect, interpret and disseminate information; organize missions to assist member governments; recommend international action (on) commodity arrangements, improvement of food production and marketing, and (on) adequate agricultural credit and food research."

It is obvious that the Economics and Statistics Division of FAO will be called upon to assume a considerable part of the responsibility for carrying out these varied tasks. Many of these will be handled in co-operation with other Divisions of FAO, but the primary function of the Economics and Statistics Division is to bring together and analyse a wide variety of statistical and economic information on food and agriculture.

The Division now in its partial mobilization consists of five branches. To the Economics and Statistics Intelligence Branch falls the basic work of collecting and analysing, country by country, the necessary statistical and economic information on food and agriculture. This Branch is building on the statistical framework established by the former International Institute of Agriculture in Rome. However, the scope of its activities extends beyond those formerly carried out by the I.I.A. Facts and figures are regarded as the starting-point for surveys and recommendations which, it is hoped, will eventually lead to common action by nations in solving world food and agricultural problems.

This Branch is now collecting statistical series and reference materials from governments. Such information is being made available for use of FAO, for the use of member governments and such other institutions and private agencies as may require material of this kind. Plans are being developed for the regular publication of statistics and for the periodic publication of analyses of current world food and agricultural problems.

The Statistical Standards Branch is now actively engaged in preparatory work for the World Census of Agriculture, to be taken in or about 1950. Draft questionnaires have been sent to Governments, and already many countries have given favourable responses on participation in the census. In March last, a regional Conference was held in Rome, attended by representatives of 19 countries. At this Conference the content of the census schedule, administrative arrangements, training of workers and other matters were discussed in detail. The Conference was highly successful and augurs well for the future of this project. Other regional Conferences will be held in the course of the next year or so.

In addition to the Census project, the Statistical Standards Branch will sponsor and promote improvement of food and agricultural statistics in all parts of the world. This is an urgent need, especially in the less developed countries where the prevailing lack of information is a major handicap in an adequate and scientific analysis of current conditions.

The Agricultural Industrial Relations Branch is studying problems in the field of general economic conditions as they impinge upon the food and agriculture problems of nations of the world. These studies include an examination of industry in relation to population problems, food consumption, and agricultural production. Questions of the levels of income, the distribution of income, financial policy, and other matters which affect the demand for farm products are to be reviewed.

The Commodity and Commercial Programs Branch is dealing in detail with the problems surrounding the more important food and agricultural products entering into world trade. These commodity studies are placed in the general world trade setting, and this involves an intensive examination of national and international trade policies.

Finally, the Production Economics Branch is concerned with analyses of the factors affecting food and agricultural production. It has a large interest in the expansion and improvement of agricultural production in the less developed countries. Efforts will be concentrated, in the beginning, on studies of farm power and machinery, including the availability of such equipment and the possibilities of its distribution to countries requiring it. Studies will be made of land settlement experiences in various parts of the world with a view to developing guiding principles and suggestions for the aid of governments and of prospective settlers. In recent years production targets or goals have become increasingly important in many countries. The procedures and results will be studied with a view to setting standards for countries that wish to introduce this type of activity. A survey of world agriculture is a large-scale project to be undertaken in the near future by this branch.

ECONOMICS AND STATISTICS DIVISION IN RELATION TO SPECIFIC ACTIVITIES OF FAO

The present organization of the Economic and Statistical Services of FAO, which has just been described, already gives an indication of some of the fields of the Division's activities. These activities, of course, fall into the general pattern of FAO's program and, for convenience, they will be discussed briefly in the following sections:

Rehabilitation

While FAO has only begun to participate in aiding the rehabilitation of war-devastated regions, it has already given considerable indirect assistance. Food appraisals have been a means of keeping nations informed on food supply developments and prospects. Such appraisals are to be continued, and will in the future be a means of anticipating food surpluses in the same way that they now spot-light critical shortages.

Production Improvement

On this continent, where we have progressed a long way in the application of modern science to agriculture, it is difficult to conceive that over two-thirds of the world's farmers are using practices that are obsolete and out of date. These obsolete methods mean that many persons are employed at back-breaking labour under primitive conditions, with extremely small economic rewards. By dissemination of information and by the sending of experts, FAO hopes to bring to the attention of many of these countries the methods which are economically sound and which can readily be put into effect to improve efficiency in production.

A very important means of assisting countries with their problems will be the sending of missions of agricultural and economic experts. A mission was sent to Greece last year, and the report which was issued not long ago contains many excellent recommendations. If these are put into effect, they should lead to a long-range improvement in the food and agricultural situation in that country. Another Mission has left for Poland, and a report should be available in the latter part of this year. Missions have been requested by Hungary, Siam and Venezuela. In fact, requests from countries for Missions may become so numerous that it will be impossible to meet them all.

A pioneer project of the war period, known as the Consumption Levels Inquiry, established per caput average consumption levels in terms of calories, proteins, and fats for the United States, the United Kingdom, and Canada. This work has been followed up by FAO, and to-day per caput consumption levels have been established for approximately 60 countries of the world. The task has not been an easy one because of the great deficiency of statistics on food and agriculture in many countries. A food balance-sheet brings together the statistics of production, stocks, trade, and the detailed utilization of food commodities. It thus is the focal point for a very large proportion of national agricultural statistics. In consequence, the food balance-sheet is an excellent starting and talking point for improvement of world agricultural statistics. Present plans are to present to each country its own food balance-sheet as a basis for discussion at the FAO Conference to be held in Geneva in August. Not only will these balance-sheets be useful in providing delegates with a statistical picture of the food and agricultural situation in their own country, but they will also form a basis for agricultural development programs and for policies designed to improve marketing and consumption.

Some of the work in the Economics and Statistics Division of FAO is closely related to the work of the Economic and Social Council of the United Nations and of other international agencies. Recently, a special

study was completed on agricultural development programs throughout the countries of the world for the Economic and Social Council. A special survey of the food situation in six former UNRRA countries of Europe has been completed, and work is now under way on a study of the food prospects in these countries for the 1947-48 consumption year. A special study is also being carried out at the request of the Economic and Social Council on world cereal needs in 1947/48.

It is obvious also that FAO has a very direct interest in the work of the International Labour Organization, especially as it relates to farm labour. Working relations have been established with the International Monetary Fund for the exchange of information and close liaison is being maintained with the International Bank for Reconstruction and Development. A representative of FAO is attending the preparatory meeting of the International Trade Organization at Geneva. Every effort is being made to utilize fully the facilities of UN and the specialized agencies and to avoid duplication and overlapping in the fields of activities in which there are common interests.

Distribution and Consumption

The primary objective in the fields of distribution and consumption is to achieve more efficient food marketing and distribution with the objective of better diets for the consumer, consistent with adequate remuneration to the producers. In the distribution sphere FAO hopes to assist governments in the improvement of marketing and processing facilities, including roads, storage-space, packing-stations, and refrigeration plants, with expert advice. Food habits in particular regions need to be studied with an eye to dietary betterment. The Organization is keeping in close touch with international agencies concerned with maintenance of full employment in order to co-operate in the general betterment of levels of living and increasing productivity with a view to a general rise in the purchasing power of individuals.

Prevention of Surpluses

So far, this paper has centered on problems which involve producers and consumers throughout the world. There is another field of FAO activity which is of most pressing concern to farmers in the Western Hemisphere, namely, the prevention of recurring price-depressing surpluses. All the programs described are vital to any lasting solution of the surplus problems. Improvement in food production and consumption, together with expanded industrialization and consumer purchasing power, will play an indispensable part in helping to stabilize markets and prices of wheat and other staple foods.

However, FAO is simultaneously tackling the surplus problem through more direct channels. On the basis of its statistics on production, trade, and consumption of all major foods in all nations, the agency may make recommendations to governments regarding action programs for certain products. It is seeking consultation and co-operation between governments to achieve a reasonable stability of agricultural prices. The FAO Preparatory Commission has already recommended specific policies designed to

stabilize markets for twelve different products, ranging from review and periodic consultation up to the somewhat elaborate set of provisions suggested for wheat. Unfortunately, it is not possible here to discuss these proposals in greater detail; but the 1947 session of the FAO Conference, to be held in Geneva in August, is designed to bring to the attention of its 47 member governments the present situation and outlook for food and agriculture generally as well as the detailed outlook for many important agricultural commodities entering into world trade. Out of this discussion may arise important recommendations for intergovernmental action. Members of FAO's staff will participate in these discussions.

Agricultural-Industrial Studies

World agricultural developments can hardly be analysed thoroughly without up-to-date knowledge of changes in general business conditions. As mentioned previously, surveys of demand and purchasing power, income analysis, rural industries and industrial uses of farm products are now under study by FAO. Also under study are certain underlying economic and social factors which have a vital bearing on world agricultural production and consumption. Ultimate improvement of world diets, for example, cannot occur unless food output grows at a faster rate than population. In certain areas of the world, notably the Far East, the rate of population growth still far exceeds any acceleration in food production. In some regions the immediate effect of an increase in food supplies might be an even more rapid increase in population. Closer consideration of the relation between population and food supply is needed before determination can be made of just what demographic and agricultural measures might be used to assure that food supplies will increase more rapidly than population.

Publication of Statistics

To an increasing extent, FAO is serving as an international clearing-house for economic and statistical information. The Economics and Statistics Division is gathering publications from all the nations to give staff members as complete a picture as possible of the world situation. It is also compiling statistics on crop production and livestock numbers, as well as trade statistics on agricultural products.

A Yearbook of Agriculture and Food Statistics is being prepared for issuance in 1947. *Part One* will include livestock and crop production statistics, showing pre-war averages, and annual figures from 1940 through 1946 for most items. *Part Two* will contain trade statistics on most agricultural products in 1946 and earlier years. Commodity reviews are being developed on cereals, fibres, sugar and fats and oils, livestock products, rubber, tea and coffee, and other commodities of world importance. They will present current and historical data needed to study the general market and production situations.

ACTIVITIES IN 1947/48

For the crop year 1947/48 the economics and statistics machinery of FAO will operate at a constantly accelerating tempo. This promises to be another critical year for agricultural producers and consumers in many

countries. Food producers in exporting countries—particularly those in the Americas—will be increasingly concerned with the maintenance of high levels of production at favourable prices. Many war-devastated areas of the world will continue to experience a desperate need for food imports. The food-importing nations are interested in reorienting their output to post-war patterns. Many underdeveloped regions are anxious to retain and improve on agricultural advances made during the war. All of these developments are stimulating an expanding demand for statistical and economic aid.

FAO's work program for the next twelve months has been geared to meet these pressing needs. The agency's operations are picking up speed as its newly-organized staff achieves a constantly more efficient teamwork. Care has to be exercised in assembling the professional staff, with the main emphasis on ability and nationality. The present staff of the Economics and Statistics Division numbers over 100 and originates from 21 countries.

SUMMARY

The scope of the projects discussed indicates the rôle which FAO's economic and statistics service is hoping to play in world agricultural development. To-day, FAO plans to open new horizons in the field of international statistics and economic co-operation. To a greater extent than ever before, facts and figures will be used as a basis for long overdue improvements in world agriculture. By assembling and interpreting pertinent knowledge of agricultural economics and statistics, FAO may be in a position to keep its member nations and the world informed on current economic trends in food and agriculture matters. Agricultural economists in all nations now have a greater opportunity than ever before to play a vital part in helping solve the world food and agriculture problems.

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1. Appendix 2, Report of Section II, Final Act of United Nations Conference on Food and Agriculture, p. 54. Hot Springs, Virginia, May 18-June 3, 1943.

SOME ASPECTS OF THE INTERNATIONAL SITUATION IN RELATION TO CANADIAN AGRICULTURE¹

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Rather than attempt a comprehensive survey of the international agricultural situation or an intensive analysis of even the status of European agriculture to-day, it is proposed to narrow the discussion to trends which have emerged and are still evolving from the post-war chaos.

The omission of any reference to the United States does not mean that the importance of that market is not recognized. Indeed, what follows might well emphasize its importance. To avoid confusion, however, it will be possible only to sketch two paramount European developments which in the not distant future may have repercussions in this country.

The points to be considered are, firstly, the shift in the agricultural production pattern which is presently taking place on a scale which is little short of revolutionary; and, secondly, the fact that any agricultural policy developed by Canada not only has economic repercussions but, to perhaps an even greater extent, also has a political impact on Europe. I believe that a realistic view of the situation points to that area as the principal market for Canadian agricultural produce on a considerable scale for some time to come; in fact the importance of Europe cannot overstressed.

It is admitted that the great areas of need in India, the Far East and Central America loom as potential users; but the development of such markets cannot be disassociated from the industrialization of these countries, and the long-term nature of this is such as to place it beyond the scope of this discussion. True, India is often suggested as a wheat market but in the FAO Commodity report on "Wheat" it is stated that (8 : p. 61):

"The governments of the Orient will not find the foreign exchange for continuing food imports, including wheat, at the level of the past year. India, for example, may have to import wheat to some extent until rice exports from Southeast Asia can be revived and until her own programs for expanding production begin to take effect. But she is as anxious to use her available foreign exchange for new equipment as European countries are to use theirs for re-equipment. Broadly, the same observations may be made about the other countries of the Orient, most of which have much smaller foreign exchange resources than India. There are, therefore, compelling reasons why the wheat-importing nations of Europe and the Orient are trying to extract themselves quickly from the present emergency and enter a period during which they will not be obliged to spend much on wheat and other food from abroad."

EUROPEAN TRENDS

What then is taking place in Europe? There are two trends, both of which hold no little import for Canadian agriculture: The revival of an agro-economic nationalism, *i.e.*, the attempt to attain an agricultural self-sufficiency, motivated by either political or security reasons; and the evolution of the agricultural pattern as a whole, *i.e.*, the change from a comparatively extensive grain economy to an intensive one of livestock and industrial crop production. In some cases the two trends may be complementary. These developments are neither new nor novel; for example, not

¹ Paper delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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so many years ago Denmark was primarily a surplus grain producing country but was forced to revolutionize its production pattern as a result of the opening of our western plains.

Following the war of 1914-1918, agrarian reforms in Eastern Europe were implemented through the beginning of the dissolution of the large estates. These reforms were, however, in a general sense limited to a redistribution of land ownership; the ruling groups retained their paramount position through domination of a rapidly developed industry and finance. A report of the Royal Institute of International Affairs points out that in the inter-war period in this area (1 : p. 41).

"The means and resources of the State were devoted to furthering industrial development and the accumulation of capital, and hardly anything was devoted to land and agriculture. There were no roads for the countryside and inadequate education; the newly endowed peasant-farmers were given little of the implements, training and credits they needed if they were to make good use of their holdings. The State generally also kept in its hands control of the co-operatives, for political ends. The fiscal policy of the States, in the matter of taxes, tariffs and prices, had the same tendency and thus added to the peasant's burden."

It should be pointed out that the land reform had gained little headway in Hungary and was by no means extensive in Poland.

This then was the situation existing in the "bread basket" of Europe prior to 1939. During the 17-year period 1922-1939, Bulgaria, Yugoslavia, Rumania and Hungary exported an average of 43.3 million bushels of wheat with a peak in 1936-37 of 88.9 million.

The prevailing poverty amongst the peasants in the region has been ascribed to too great a population and too little capital investment in agriculture. As a result of the latter, grain production predominated.

Even before the end of the war, however, a new pattern was envisaged for Eastern Europe. In 1944, Sir John Russell pointed out the necessity of a replacement of grain production by the production of protective foods which might even necessitate imports of bread grains and livestock concentrates (1 : p. 11).

In London on July 9, 1942, a Peasant Program was drawn up and signed by twelve agrarian experts and representatives of peasant communities in Central and South Eastern Europe, from Bulgaria, Czechoslovakia, Greece, Hungary, Poland, Rumania and Yugoslavia. The fifth clause of this document under the heading of "Need for Balanced Agriculture" reads (1 : p. 20):

"Agricultural production must be well-balanced. Cereals have hitherto occupied too large a place in some of our countries. We therefore prescribe the introduction of more varied crops, e.g. fruits, vegetables, poultry, livestock, etc. Such improvements should be introduced as the result of scientific advice on the types of production most suitable to local soils and local climate".

Such a program, stressing the production of protective foods by European countries, has also been advocated by the Food and Agriculture Organization.

Even though political events in the Eastern sphere have taken a turn quite different from that anticipated by the agrarian committee, it is of great significance that agricultural re-adjustments have been and are being implemented that are not far removed from the advocated trend.

In short, the bread basket has been turned upside down to make a rabbit hutch; agriculture in eastern Europe is changing from a grain to a livestock and industrial crop economy.

This development stems from two sources, firstly as a corollary of land reform, and secondly as deliberate governmental policy.

In *Bulgaria* a two-year agricultural plan has been instituted to increase output in 1948 by 34 per cent above 1939 levels. By products the target increases are: wheat 14 per cent, maize 121 per cent; barley 26 per cent; sugar beets 148 per cent; rice 72 per cent, and sunflowers 116 per cent. Bulgaria was, except in the case of rye, the smallest grain exporter of the four Danubian countries.

The emphasis is being placed on industrial crops in conjunction with a great expansion of livestock production; the raising of milk yields by 70 per cent will, for example, utilize much if not all of the increased crop production. In addition it should be noted that a widespread expansion of industry itself is planned through the medium of extensive electrification developments. Until her livestock and livestock products become surplus to local needs, Bulgaria will have little agricultural food products to export save for perhaps some industrial crops.

In *Yugoslavia*, the Land Reform Bill, passed in August 1945, limited all existing holdings to a maximum of $86\frac{1}{2}$ acres; all land above that is to be distributed to peasants in lots of about $12\frac{1}{2}$ acres per family. The Commission for Mines stated (in January, 1945) that Yugoslavia would have to rely in the future on intensified industrialization as there was little room for further development of agricultural and timber resources. The inevitable result of such a break-up of large farms is, apart from the loss of efficiency, a striving on the part of the peasant to engage in some intensive lines, e.g., small livestock for a capital investment, as well as to produce all his needs on his own farm. Thus, although production of bread and feed grains will decline, domestic consumption will increase. Yugoslavia cannot be anticipated as a source of export foodstuffs in the future on a scale comparable with the past, even though the Government has as yet not attempted any direct alteration of its agricultural pattern.

Romania is in a position little different from Bulgaria and Yugoslavia. Land reform was the first declared objective of the new administration in 1945 and has gone on apace; some 15.76 million acres have been redistributed since the war, with the average family receiving 12.3 acres. Large estates, except those of the Church and of the Crown, have been reduced to about 100 acres. On top of heavy reparations in the form of grain and livestock levied by the Russians, Romania is suffering from two successive years of drought, with wheat yields last year less than half and maize less than 25 per cent of normal; in some provinces the latter averaged only one per cent. The climb-back to a surplus agricultural level will be a long and arduous one for Romania, and it is virtually certain that any such surplus will be in a form other than cereal as a result of the break-up of the large grain estates.

The fourth country in the Danube Basin is *Hungary*; and it is here that we see a change in agricultural pattern as the direct result of deliberate governmental action. In this last stronghold of latifundia in Eastern

Europe land reforms have been far-reaching and drastic. An area of almost $3\frac{1}{4}$ million hectares, the equivalent of almost 60 per cent of the total arable area, has been confiscated; almost 2 million hectares of arable land redistributed in parcels averaging slightly less than 3 hectares or about 7 acres in size.

Apart from there not being enough land to go around, agricultural rehabilitation through co-operative efforts is hindered by the stubborn independence of the land-hungry peasants. The government has stated, in the second monthly report of its FAO Committee, that the benefits of its program will be very slow in their realization.

Positive direction is, however, being given to the changed pattern. It is stated in the report that (3):

"Under the present circumstances and with a view to future trends the agricultural government wishes to put an end to the one-sided overproduction of cereals, chiefly because export surpluses may be forecast with diminishing world-market prices leading to losses. Also these extensive grain branches of production do not ensure the self-preservation of the new farmers and their families, and it is natural that the domestic production of cereals should be limited to the country's needs."

The recent political developments in this country would not appreciably alter this program. Certainly it would not be reversed.

To summarize, the three main Danubian grain-producing countries—Romania, Hungary and Yugoslavia—that in the pre-war years 1935-38 exported an average of 1,491,400 long tons of wheat, rye, and flour equivalents (the rye being only a small quantity, 137,000 tons) and 1,288,700 long tons of coarse grains, principally maize, in the year 1945-46 imported 645,200 long tons of the former category and 52,600 long tons of coarse grains with no exports save those taken as reparations. For 1946-47 the program drawn up by the I.E.F.C. allows an import of 292,000 long tons of all grains for these countries.

Future prospects for the resumption of exports may be considered as being very limited in the presently foreseeable future.

Before considering the import of these changes, let us note briefly the *Polish* situation. The Central Board of Planning in Warsaw drew up a plan of economic reconstruction for the four years 1946 to 1949, inclusive. Although in the past Poland has been a grain exporter, and in addition the area acquired from Germany produced a considerable surplus, physical difficulties loom large in the rehabilitation of this country's agriculture. The governmental proposal is to strive towards a more balanced agriculture. Under "Realization of the Plan—Agricultural Production", it states (4):

"Here the most urgent task will be the elimination of the uncultivated land. This should be attained in 1948. The continuing increase in agricultural production should ensure to Poland self-sufficiency in food (with the exception of a few items), beginning with the crops of 1947. The index of *per capita* agricultural production should reach 110 in 1949 (1937-38 = 100).

"The main trend of the Plan will be to increase animal production and industrial crops. . . . In terms of adjusted U.S. dollars, exports of food in 1949 are estimated to exceed imports by 30 millions as compared with 75 in 1938."

To quote again from FAO Commodity Report on Wheat (8 : p. 45):

"In Poland, the settlement of the newly acquired territories with peasant families and the difficulties of agricultural rehabilitation will prevent the emergence of any grain surplus for a considerable time and Poland may, when that time comes, prefer to develop export markets for livestock products rather than for grain."

Whilst severely adverse weather conditions have set these objectives back a year or more, it does not mean their abandonment, and considering the highly favourable horse-trade of Eastern territories for the area acquired from Germany, they are not unduly optimistic. In fact, in the over-all picture they portray a decline in surplus production on a regional basis.

That, then, is a sketchy outline of the situation east of the Iron Curtain which, through its effects on the economies of Western Europe, is of great concern to Canadian agriculture.

THE PROBLEM OF GERMANY

The corner-stone of Western Europe is Germany. On her reconstruction depends the future trade not only of The Netherlands and Denmark, but also of the United Kingdom and, therefore, of Canada.

Propaganda and prejudice have confused the German problem in an attempt to be obstruent but it is in reality very simple, although the solving of it appears at times to be well nigh impossible.

Germany may be considered in terms of four sets of boundaries: the old Reich, *i.e.*, the territory forming the country prior to the Austrian Anschluss; rump Germany, *i.e.*, the old Reich minus the area taken over by Poland east of the Oder-Neisse line; the Western zones, *i.e.*, those occupied by the United Kingdom, the United States and France; and the present working unit, the bi-partite Anglo-American zones. Details of pre-war surpluses and deficits for the various areas will be found in Table 1.

As a whole, Germany has lost 25 per cent of her agricultural area and slightly more of her arable land, whilst her population is even greater than before 1939 when she was only able to produce 83 per cent of her food requirements and was second only to the United Kingdom in food imports.

The agricultural problem in Germany may be simply stated—too many people and too little productive land, and a present inability to pay for imports. In the Anglo-American zones (and it is more realistic to

TABLE 1.—ESTIMATED PRE-WAR SURPLUSES (+) AND DEFICITS (−) IN
FOODSTUFFS IN GERMANY*

(Thousand tons per annum)

	Western zones	Soviet zone	Ceded area	Old Reich	Rump Germany
Bread grains	−1550	+340	+1130	− 80	−1210
Barley	− 425	+ 50	+ 230	− 145	− 375
Oats	− 100	+100	—	—	—
Potatoes	− 340	−330	+ 560	− 110	− 670
Sugar	− 465	+235	+ 200	− 30	− 230
Butter	− 15	− 95	+ 25	− 85	− 110
Meat (including animal fats)	− 200	−300	+ 260	− 240	− 500
Vegetables and marine oils (as margarine)	− 365	−125	− 60	− 550	− 490
Fish	+ 85	−245	− 70	− 230	− 160
Oil cakes	− 650	−270	− 260	−1180	− 920
Imported cereal feedingstuffs	− 720	−170	− 160	−1050	− 890

* E. F. Nash, "Food and Agricultural Conditions in Germany", *Journal of Proceedings of the Agricultural Economics Society, Oxford*, Vol. VII, No. 2, January 1947, p. 152.

consider this area as there appears to be small prospect of any immediate reunion with the Soviet zone, and the addition of the French zone would change matters but little) the population has increased by nine million or 25 per cent since 1939; the populations of the U.K. and American sectors of Berlin (formerly fed from the East) must be included as they are now dependent on foodstuffs from the respective zones. In addition, due to a decline in soil fertility as the result of fertilizer shortages, a decrease in the quality of seed, as well as deterioration of cultivation practices resulting from obsolescence or absence of equipment, production has decreased by 35 per cent.

It should be mentioned as well that the cessation of imports of oilcake, protein concentrates, and feedstuffs has resulted in a decline in the calorific content of the total agricultural production.

Prior to 1939 the Anglo-American zones were dependent upon food imports from other sections of the Reich and from abroad for one-third of their consumption requirements, which averaged 3000 calories *per capita* per day for the whole population (2):

"Approximately one million tons of bread grains, a little less than one million tons of potatoes and 400,000 tons of sugar came annually from the area which is now the Soviet zone and from the area east of the Oder-Neisse line. Annual imports from abroad into the two zones averaged 700,000 tons of bread grains, 1.2 million tons of feed grains, 1.5 million tons of oil seeds in addition to other foodstuffs.

"A re-establishment of the 1935-38 agricultural production level would provide an average of roughly 1350 calories per day for the non-self suppliers leaving a dependency on outside sources for 700 calories to sustain a minimum 1800 calorie ration level for normal consumers (2050 average non-farm)."

In 1945-46 the deficit between indigenous availability and target requirements was 37 per cent. With a desired increase in 1946-47 in the target from 1501 calories daily to 1660, the deficit would be 40 per cent in spite of all the efforts at improvement of local production, and in 1947-48 with the target at 2050 the deficit would be 47 per cent.

Every effort is being expended to bring production up to pre-war levels but the best that can be hoped for is 1087 calories per person per day by 1947-48; in 1945-46 it was 941 calories and the estimate for the current year was 991.

Translated into terms of foodstuffs this will mean the importation during 1947-48 of the following amounts in order to maintain a ration of 1800 calories *per capita* per day for normal consumers:

	Tons
Wheat	3,845,000
Peas and beans	180,000
Dried milk	6,000
Fish (processed)	100,000
Vegetables	100,000

The wheat is equivalent to 141,265,000 bushels, and the estimated cost at current prices of the above amounts is \$517 million. Should full indigenous capacity be restored and population remain the same, import requirements of wheat will still be above 95 million bushels.

In 1938 about 27 per cent of Germany's grain imports came from the Danube area and most of the remainder from the Argentine. With the former eliminated and the latter area remaining aloof from any price negotiations it is obvious that there is a great potential market for North American cereals.

DEPENDENCE OF OTHER COUNTRIES ON GERMANY

The revitalization of the German economy to enable it to pay its way is not a problem only of the Americans and British; it concerns the Low Countries and Denmark as well. Before the war one-quarter of The Netherlands' imports came from Germany and one-sixth of her exports were sold there. About 60 per cent of the iron and steel, chemicals, machinery and spares and coal required by Dutch industries came from Germany. In addition one of the chief sources of The Netherlands' national income was derived from payments for the use in transit of her seaports, railways, waterways and canals; with Rotterdam having an annual turnover alone in excess of 40 million tons. Three-quarters of this transit trade was to and from Germany.

It is of interest to note that last year Dutch vegetables were dumped into the sea because of a lack of market for them other than in Germany, and there the authorities were too short of foreign exchange to spend it on other than high calorific foods.

Danish prosperity, too, is related in some extent to that of Germany. Apart from a similar tie-up regarding machine spares, a sizable portion of Denmark's food was, before the war, exported to the Reich, which ranked next to the United Kingdom as her best customer for foodstuffs. During the period 1935-39 the average annual percentage of Danish exports which went to Germany were: *Butter* 23.4; *cheese* 56; *eggs* 24.3; *dressed chickens* 92.5; *bacon* 1.6; *live pigs*, 93.6; *beef* 31.1; *live cattle* 87.5; *offal* 75.5; and *horses* 60.6.

With the virtual disappearance of this market, and the prevailing shortage of feed grains and concentrates, Denmark has had to retrench and drastically curtail imports. If this situation is prolonged it will mean a continuation of the lowering of the standard of living for the Danes, consequent on reduced production or, alternatively, the attainment of a virtual monopoly of the United Kingdom market.

AGRICULTURAL LEGISLATION ELSEWHERE

It might be mentioned in passing that legislation introduced in the Swedish Riksdag provides for the attainment of self-sufficiency within 20 years through a rationalization of agriculture by governmental directive.

Far-reaching agricultural legislation has passed the British Parliament which carries out principles enunciated in other countries, differing mainly only in degree. There is great agitation in the United Kingdom for an increase in the production of such products as bacon on the grounds that considerable foreign exchange would be saved by importing feedstuffs instead of bacon, eggs and poultry.

To sum up, we see the large surplus producing areas of Eastern Europe being transformed into industrialized, agriculturally self-sufficient countries with a potential export of livestock products and industrial crops; but the direction of this export is uncertain due to political policies. It may well be that industrialization will be so rapid as to develop home markets for more foodstuffs than these countries can produce. This would, however, necessitate a much greater degree of co-ordination between nations than

presently exists. Current developments are variously motivated by the ideas of self-sufficiency, the general raising of the standard of living, and economic and military security.

In Western Europe we see countries already devoted to the production of protective foods but desperately short of raw materials such as feed grain and oilcakes and even sometimes short of markets.

In the centre of the Continent lies Germany, a vast potential market with no prospect of decreasing food import requirements below 53 per cent.

It is obvious, therefore, that any policy drawn up by Canada must have inevitable economic echoes in Europe and with food being most sought after, political repercussions are almost axiomatic.

THE EXCHANGE SITUATION

Up to now, the exchange problem and its repercussions on international agriculture has been merely alluded to. To put it succinctly, it amounts to a world shortage of dollars which affects Canada in three ways: *Firstly*, it hinders the ability of European countries to pay for agricultural imports; *secondly*, there is the possibility, if the shortage becomes chronic, of a more or less permanent re-orientation of the European production pattern leading to a permanent reduction of imports from North America, and *thirdly*, if the countries are unable to pay, Canada may be hard put to provide credit to maintain existing imports.

Simply stating the problem does not mean that its magnitude is not recognized; but it is desired to stress that this magnitude does not invalidate the necessity of carefully considering the underlying dynamics in the most important of the world's food markets, Europe.

THE RUSSIAN FACTOR

Another important factor is the U.S.S.R. Space does not permit an adequate discussion of the implications of the political use of foodstuffs on a large scale. Suffice it to point out that last year, with the worst drought in the Ukraine in 50 years, wheat was shipped to France at a politically strategic time, and that it has been reliably stated that some was offered to the United Kingdom. There has been some suggestion also that, in the recent Anglo-Russian negotiations, provision has been made for the shipment of wheat. But the implications of a state agricultural monopoly, powerful enough to dominate world markets, might well be the subject of a separate paper.

FOOD AND AGRICULTURE—AN INTERNATIONAL MATTER

The only hope of preventing an intensification of the agro-nationalism such as prevailed prior to 1939 and is once more coming to the front lies in such bodies as FAO and the Economic Commission for Europe. It is

through such bodies that plans for agricultural development may be integrated to the benefit of all concerned. This, in turn, is dependent to no small extent on the political and military situation. To take just one example the following statement (6) is significant:

"The general and the military situation will not be such in the near future that Switzerland can be bound by any international program or suggestion to give up its plan for the highest possible self-sufficiency in foodstuffs, which has been set up with many sacrifices and efforts, in favour of a 'long-term program' as proposed in Hot Springs. No country can be asked to adjust its agriculture without far-reaching guarantees for its agricultural and military security."

In this rapidly changing world agriculture has a part to play that is more prominent than perhaps at any time since the seven lean and the seven fat years. And perhaps it is not in error to say that never has the production and distribution of food been so closely integrated with the economic and political development of virtually every country.

With the disappearance of the Danubian area from the grain export trade, Denmark, The Netherlands and the United Kingdom must look to the Americas and Australia for their cereals; the last named, however, is seeking the development of Asiatic markets.

If feed grains and concentrates are not forthcoming to Denmark and Holland at reasonable prices they must seek a degree of self-sufficiency, a return to a former status of grain production and consequent drastic lowering of their standard of living. This in turn will adversely affect the United Kingdom and have its inevitable repercussions in Canada. The alternative is for countries like Denmark to look eastward and become completely integrated with the economic sphere of the U.S.S.R.; such consequences are too far-reaching to be discussed at this time.

The programs of FAO, ECE and ITO are by no means fantastic in their approach and emphasis on international co-operation. As the London Statist said regarding ITO (7):

"Dire economic necessity brings countries to the point of making unwilling concessions to obtain advantages that have become vital to existence."

Governmental regulation of export trade, particularly in regard to foodstuffs, is a recognition of this fact. With the world situation the way it is to-day, and there being no hope for any appreciable betterment in the food situation before 1949 at least, I believe that any study of agricultural policy dare not neglect the international aspects that are nearly always involved.

"Government intervention on international trade to regulate or negotiate terms and conditions of exchange must now be recognized as a feature of the world's economy.

"The dangers inherent in such developments are equally evident both because of the dislocations inherited from two world wars and because in the very process of constructing a new world economy and of developing the hitherto backward areas, there will be many opportunities of friction and many potential conflicts of interests. Old channels of trade will be diverted or even closed. Unless provision is made for full and frequent consultation among governments on specific economic problems, the chances of steering a successful course amidst all these difficulties will be slender." (5)

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First of all, I would like to compliment both Mr. Rutherford and Mr. Marshall on the very interesting papers they have presented. I am only sorry that I agree with so much of what they have said and can find so little in their papers about which I might start an argument. I think, therefore, that I shall have to try to develop one or two additional angles of the subject and in doing so I may suggest a change of emphasis on some of the themes already so ably developed.

Understanding Means Co-operation

It seems to me that one of the greatest stumbling blocks to full co-operation between nations is a lack of understanding, and even knowledge, of one another's systems and problems. Even individuals co-operate successfully only when they know each other's peculiarities. The same is true of nations, and looking at this in the broadest sense, there seems little doubt that FAO, in company with other UN organizations, can do an untold amount of good in this field alone.

Again from the more purely economic aspect, the bringing together of technical information and economic policies from different countries into one world pool should provide every nation with the opportunity to see its policy and techniques in true world perspective. In theory, the result should be a fitting of national policies into a world pattern and an evening-up of the standards of efficiency all-round.

I say "in theory," because such results cannot come unless every nation is prepared to open its eyes to world-wide realities and not yield to the temptation to pursue its own individual course. If these conditions of co-operation could be achieved—as they would be if every member of the United Nations adhered rigidly to the Charter—then I feel quite certain that Mr. Marshall would not need to worry any further about the agricultural trends he has noticed in Europe.

Reasons for European Agricultural Trends

Now what about these trends? I think we should look into the reasons for them so that we can better assess their rights or wrongs. Apart from political considerations, I think there are two economic forces at the root of these trends: (1) the overwhelming desire of farmers for a policy of stabilization; (2) the shortage of foreign exchange.

Desire for Agricultural Stability

The desire for agricultural stabilization is not confined to Europe; you have it in Canada and the U.S. as well. The reasons for this desire are not far to seek. First of all, farmers have a vivid memory of what happened after the last war; and secondly, by virtue of the nature of their industry, they are not able to cushion themselves against a depression in the same way as other industries. Perhaps if industrialization had always remained at

¹ Delivered at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

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the cottage-loom stage, and if labour had never formed unions, then special measures to organize and stabilize agriculture would not be necessary. But these developments have been part of a general trend leading to higher standards of living, and therefore we can only accept them as being useful. The fact remains, however, that once industry and labour have become organized into solid blocks, the remaining section of the community, the farmers, are at a decided disadvantage. Yet the farmers are as vital to a nation as are labour and industry. Hence, the time has come when someone—be it the Government or otherwise—must act to stabilize agriculture by some system of organization.

Shortage of Foreign Exchange

The second main reason for planned economies is that European countries generally are very short of foreign exchange. They must have some means of directing production to keep it in line with demand and with the imports that are feasible under their foreign exchange conditions. Here again, if no large scale industrialization had been developed, this problem might not have arisen but equally so the standard of living would be very low.

The war accentuated this problem; for example, take the case of the United Kingdom. We have nearly 500 people per square mile compared with something over 4 per square mile in Canada, that is, a density of population over one hundred times as great as Canada. We must import large quantities of food and to pay for this food we must export industrial goods. Before the war we exported goods and services (shipping, etc.) to pay for nearly 70 per cent of our imports, the other 30 per cent coming mostly from interest on overseas investments. But these investments are now gone. We had to dispose of them to buy war materials. At the same time, the war brought about complete dislocation of our economy. About three-quarters of our manpower was diverted solely to the war effort, resulting in a reduction in our exports to a mere 29 per cent of the 1938 level. Our problem now is to reconvert our economy so as to increase our exports and if necessary cut down our already reduced imports until a balance is achieved.

Adding to the difficulties of achieving this balance are the other large losses we sustained during the war. For example, we had four hundred thousand houses destroyed through bombing, valued at six million dollars, while we lost practically half our available shipping. As well, our overseas debt was increased by twelve billion dollars while our loss of manpower totalled three hundred and eighty-seven thousand, or almost one person in every hundred of the population.

This difficulty of balancing exports and imports is typical of Europe generally and the problem would have been even greater had it not been for the far-sighted help of Canada and the United States. However, this help must only be regarded as a temporary relief, until we get our economy reconverted. The result is that we simply cannot take any chances. We must plan our resources very carefully and that is perhaps the strongest reason why national planning is now more vital than ever.

This argument can be carried even further to say that by having a national plan we are in a much better position to co-operate with other nations and to ensure that our international obligations can be fulfilled. Therefore, provided planning goes in the right direction, it should be beneficial to the rest of the world and not harmful. The direction in which planning does go, however, must depend to a large extent on the attitude of the more favourably placed countries. That means that Canada has a share and responsibility—even if an indirect one—in the shaping of the economies of European countries.

Achieving World-Wide Expanding Economy

So much for the two economic reasons for the European agricultural trends referred to by Mr. Marshall. I have mentioned these because it is only through this fundamental approach that we can judge the merits of these trends, and whose fault it is if the trends are not to our liking.

That brings me to another point where I would change the emphasis from Mr. Marshall's paper. I feel that we can consider the problem only in terms of the whole economy. An agricultural economy cannot be planned or criticized in a water-tight compartment. Canadian agriculture may be affected more by the over-all employment and general economic policies of other countries than by purely agricultural policies.

It would seem that the first essential to world-wide agricultural prosperity is a national and world-wide expanding economy designed (1) to ensure full employment in the well developed countries and (2) to encourage capital investment and industrialization in more backward countries. Agriculture in Canada or any other country cannot continue to prosper if there is industrial depression or unemployment in Europe. Similarly industrialization of the undeveloped countries of the Far East must help too. But this needs capital, much of which can come only from the well developed countries. I feel that this point is not always sufficiently realized. I would like to emphasize it further but time does not permit. Perhaps, however, I can quote an example.

United Kingdom Example

The United Kingdom achieved her industrial greatness by foreign lending. Much of the money lent was spent in the United Kingdom on industrial goods, and that in turn led to industrial prosperity which in turn again led to an increased market for United Kingdom farmers and incidentally for Canadian farmers as well.

Even now the United Kingdom, despite her own economic difficulties, is engaged in a heavy lending and help program designed to get the wheels of industry going in Europe. Since the end of the war, she has contributed seven hundred and forty million pounds (almost three billion dollars) in gifts and credits to other countries; almost half of this total will not be paid back. As well, the total does not include payments to the International Bank, International Monetary Fund, to the colonies or to the International Refugee Organization. Despite the fact that the United Kingdom has been very short of coal, nearly two million tons of coal were shipped to Europe between D-Day and July, 1945. At least half of this was for civilian consumption.

I am sorry if I seem to have gone too far from the beaten track but I mention these developments to stress the fact that agricultural planning cannot be divorced from over-all national planning and that national planning cannot really be divorced from international planning. With this background in mind, perhaps we can now turn to our United Kingdom agricultural policy as laid down in the Agriculture Act recently passed in Parliament.

United Kingdom Agricultural Policy

Briefly, we have two main agricultural aims: stability and efficiency.

Stability

Stability is to be achieved through a system of guaranteed prices and assured markets. Fixed prices will be announced sufficiently far in advance to enable the farmer to plan his production with confidence. For example, crop prices will be fixed early in the year previous to that in which crops are harvested. In the case of livestock products, *minimum* prices will be announced from two to four years ahead and *actual* prices one year in advance.

As was the case during the war, prices will be reviewed once a year in consultation with the National Farmers' Unions. At this review, the whole agricultural economy is considered, including income and cost of production figures produced by independent agricultural economists stationed at the universities and colleges in the different provinces, together with any relevant data produced by the Ministry of Agriculture and by the Farmers' Unions. In addition, the demand and supply position regarding each agricultural product, both outside and inside the United Kingdom, are fully considered and the resulting prices calculated to give a fair return to producers and at the same time guide production in the direction of greatest use to the nation. There is no standard formula for the calculation of prices. Instead prices are the result of discussion and consideration of all relevant factors, including demand, supply, foreign exchange position, cost of production and general level of farming income in relation to other industries.

Efficiency

Now coming to the efficiency side of the Government's policy, the aim is to achieve maximum efficiency through the provision of technical advice. For this purpose a new National Agricultural Advisory Service has been set up as a branch of the Ministry of Agriculture. The aim is to have one advisory officer per thousand farmers. Previously agricultural extension work was the responsibility of the universities and County Councils, aided by grants from the Ministry of Agriculture. It is also intended to establish an Agricultural Land Service for the purpose, among other things, of advising landowners on estate management problems.

Linked with the advisory or extension service, are County Agricultural Executive Committees. These committees, which are the successors of the wartime committees, are appointed by the Minister of Agriculture. Each committee consists of 12 members, 5 of whom are the direct nominees of the Minister; 3 are appointed from names submitted by The National Farmers' Union; 2 from names submitted by the Farm Workers' Organizations, and 2 from nominees of the landlords' organization (the Central Landowners' Association).

These committees have the authority to enforce reasonable standards of good husbandry and estate management, where necessary through issue of directions. Farmers or landlords who refuse to rise to these reasonable standards may be put under supervision for a year and if, after that time, there is no improvement the committee may, with the approval of the Minister, serve notice of dispossession. The farmer or landlord, as the case may be, however, has the right of appeal to an independent Agricultural Land Tribunal, the decision of which is final and binding on both the Minister and the committee.

I should mention that these powers are not required to deal with widespread inefficiency, as in fact the efficiency of our farmers compares very favourably with that of farmers in any other country. Instead the powers are needed to deal with the few cases where a farmer is either unwilling or unable to take advantage of the services provided for him.

In the eyes of some observers, the possibility of a farmer's being dispossessed is regarded as rather a drastic curtailment of his freedom. The fact remains, however, that the farmers have continually demanded a policy of stability from the Government, and they prefer to have that stability and give the required guarantee of efficiency in return (even risking dispossession) rather than to have no stability. The representative organizations of the farmers, the landlords and the workers have all indicated their support of the policy. Furthermore, they have had experience of the policy, in more drastic form, during the past eight years, so can base their opinions on experience.

Three main factors have contributed to the formulation of this policy and to the unanimity of opinion regarding it: (1) our shortage of agricultural land compared with our population; (2) our high proportion of non-agriculturists or consumers—93 per cent—who must be safeguarded against fixed prices leading to inefficient production; (3) our shortage of foreign exchange. There are various other provisions in the new Act including further safeguards for tenant farmers, but I will not take time to deal with them.

Effect at Home

What will be the effects of our agricultural planning? We hope for greater efficiency of production but we do not aim blindly at self-sufficiency. Rather our policy is to produce those commodities for which our climate is best suited and to import commodities that can be more economically produced elsewhere; always subject, of course, to the availability of supplies and foreign exchange. The point I should emphasize regarding our Act is that it does not lay down a production policy; instead it provides machinery through which stabilization can be achieved and production directed as required to fit in with conditions in the rest of the world.

Perhaps, however, you may wish me to make a guess as to the direction in which our production may go. Generally speaking, our climate is more suitable for the production of forage crops and livestock products than for grain. Accordingly, with world conditions permitting, we are anxious to increase our livestock production and reduce our tillage area.

Effect on Canada

As to the effect on Canadian exports, let us look at a few individual items. First of all, take *wheat*—obviously our policy should not lead to any reduction in imports of Canadian wheat. Then take *cheese*—since the war, consumption of liquid milk has increased to such an extent in the United Kingdom that we cannot produce enough milk to meet the liquid demand. Thus even with a substantial increase in milk production we shall still have very little milk left over for cheese-making. It looks, therefore, as if we shall have to import considerably more cheese than before the war.

As far as *bacon* is concerned, it is true that we want to increase hog production as soon as feeding-stuffs are available. As Mr. Marshall said, importation of feeding-stuffs requires only half as much exchange as importation of bacon. As well, we have had over half our pig-houses idle since the beginning of the war. At the same time it must be remembered (1) that our hog production at present is down to one-third of pre-war; and (2) that total supplies, home-produced and imported, at present are meeting only a fraction of the demand. We do not expect to get back to our pre-war production in a year or so, especially as we can only do it with imported feeding-stuffs, and at present I cannot see any prospect of Canada's producing more bacon than we can take.

In summing up, may I say that, as I see it, the crux of the problem is—What can be done to (1) relieve the dollar shortage and (2) stimulate full employment policies in Europe, and (3) provide the capital for greater industrialization in the more backward countries? Whether or not such an expanding world economy develops would seem to depend largely on the capital forthcoming from the well developed countries and also to have a greater effect on Canadian agriculture than the purely agricultural policies of European and other countries.

BASES FOR A RESEARCH PROGRAM IN AGRICULTURAL ECONOMICS¹

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This is a paper on agricultural policy. It is a paper which attempts to show the challenge which faces research in agricultural economics and our responsibility in meeting that challenge. Economic policy for agriculture at all levels must be shaped against a background of the findings of economic studies regarding the effectiveness of the use of resources, and against the background of standards of social efficiency appropriate to Canada.³ No attempt is made in this paper to appraise the research in agricultural economics which has been conducted in the past. Much of this has been very useful and timely. Rather, the intention is to place emphasis on the future of research programs in this field—and to consider these against (a) the present and prospective problems of the agricultural industry and (b) the present state of methodology in this area of investigation.

On research in production and price, or putting it in alternative terms, on questions dealing with the effectiveness of the use of all production resources, our findings must be carried to the point where their policy implications are unmistakably clear. On the other hand, analysis in terms of social efficiency must ask whether improvement can be made by altering the distribution of income within the farming industry or between that industry and the balance of the economy. This raises the question of various types of aids and subsidies, with which, fortunately, we have had some experience. We have had a fairly long experience with altering income patterns. We have provided for progressive income taxes, several types of social security benefits, farm subsidies, public education, highways, and many other services. Let us not forget that Federal, provincial, and municipal tax authorities take an estimated 35 to 40 per cent of the income payments to individuals, and redistribute these funds, to a considerable extent, in an effort to increase the social efficiency of some people and some industries. Nor should we neglect a point of particular interest to the farm community—that tariff restrictions are just as real a means of altering income patterns of various groups in the economy as are farm subsidies. One is indirect; the other direct.

As one reads research publications in agricultural economics, one does not get the sense of urgency and the seriousness of the present and prospective situations which underlie the research studies. Certainly it is high time, through research, to point toward definite policies aimed at preventing another period like the 1930's when "chronic fears, worries, and resentments seek unhealthy outlets". The stability of governments themselves would certainly be threatened by another period of extremely low prices and

¹ A paper prepared for delivery at the 17th Annual Meeting of the Canadian Agricultural Economics Society held at Lethbridge, Alberta, June 23-26, 1947, in conjunction with the 27th Annual Meeting of the Agricultural Institute of Canada.

² Professor.

³ While this dichotomy of resource use and social efficiency is not new, Professor Schultz of the University of Chicago has recently restated it very effectively and set forth its implications to analysis of the agricultural industry (7). He includes among the essentials for social efficiency nutritious food, clothing, housing, education, and leisure time. When actual levels for these welfare variables drop below minimum standards, a welfare disparity is deemed to exist and we can presume that the results of this disparity will also be reflected in the economic productivity of the workers involved.

unfavourable yields. Because our tools are crude we cannot give very accurate answers to these problems. However, the tools are sharp enough to provide analyses which would show a wasteful use of resources in many parts of Canada. We may lament that we cannot measure accurately the net marginal product of important factors of production. But are not many of the maladjustments of resource use so glaring that they could be shown up clearly in terms of average productivity? And there are available several direct measures and indicants of average productivity for important farm production factors. It is possible to delineate the areas of greatest misuse of resources sufficiently clearly that, by any conceivable standard, the policy implications in terms of shifting resources would be unmistakable. We have the responsibility of carrying out the analyses which will establish the case for readjustments within the farming industry. If we do that job well, the press, the radio, educators and others will spread the news so that action, in terms of specific programs, will be unavoidable.

Lest it be thought that we are generalizing too broadly, let us focus directly on the research problem. We must keep clearly in mind the necessity for setting up each research project in such terms that we can measure and make judgments of both the economy of use of resources and the social efficiency of the segment of the industry being examined. In the former types of analysis, those dealing with production inputs and outputs, using prices and returns as measuring tools for allocation of resources, we must set up our projects to answer whether or not total output can be increased by shifting the use of any resource input. This analysis should be made to answer this question in terms of the following types of possibilities for shifting the use of resources (*a*) within farms, (*b*) between farms—mainly an inter-regional problem, and (*c*) between agriculture and the balance of the economy (7).

Category (*a*), studies of internal farm adjustments, is the problem of farm management in the micro sense. We must not give in to the tendency to treat problems of farm policy without consideration of this micro aspect. The real working basis for most farm policy rests ultimately on the way production inputs are used on individual farms. While there are available many series of data which can be used for analysing problems in categories (*b*) and (*c*), that is economic relations between farms on the one hand, and between agriculture and non-agriculture on the other hand, the most useful of these series must be drawn from enumerations and studies of individual farms.

FARM MANAGEMENT STUDIES

There are not many economists who are happy about research in farm management. It is certainly not necessary to deal with the limitations of much of this work. Let it suffice to list some of the more important objections:

(1) Too little attention is given to sampling, thus rendering research more costly, yielding results of questionable utility, and making it impossible to aggregate results from individual farms and groups of farms to a defined universe or sub-universe of farms.

(2) The common analytical procedures involving the widespread use of cross tabulations do not yield results which are a basis for getting at the question required of farm management, namely: What is the net effect on income of adding or withdrawing specific production inputs? Nor are the results of cross tabulation a valid basis for getting at even the problems they attack.

(3) Farm management studies are limited too greatly to analysing historical data. Published studies generally refer to data two to five years old. Even as history the findings generally have little relevance to the needs of farmers in planning their business for years ahead; the wide and erratic fluctuations in yields, prices, and costs, to which Canadian agriculture has been subject, are themselves analysed and consequently the results are generally spurious as far as aiding the farmer in projecting his plans. Farm management research is not sufficiently forward-looking.⁴

(4) Traditional farm management analysis fails to take into account several fairly elementary and some subtle aspects of the nature of the unit of organizing and managerial ability, problems of size of farm and scale of operations.

(5) It is unfortunate that some resources are still going into cost of production studies. Financial cost data which arise from farm management studies do not lend themselves to answering the really important questions on use of production factors. There are several other objections which have been well established in the literature of the field. Cost of production data have some of the same objections as parity price data. If data are favourable to their case, interested farm groups will demand of government: "Give us cost of production!" in the same way as American farm groups have demanded parity. Both cost of production and parity may be bad (in economic terms) for the very groups who demand them. Most types of cost studies, rather than helping government to reach rational farm policies, provide the basis for embarrassing government and supporting irrational policies.

While the above represent important difficulties with farm management research, we should not despair of reaching good quality work in this field. Sampling presents difficult problems, but it is possible without large outlays to do a satisfactory job. Of first importance is the need for some description of the universe and sub-universes of farms. No research should fail to take full advantage of the classification work provided in type of farming studies. It is advantageous to commence with a type of farm area and proceed to the following sub-classifications: (a) topographic; (b) size classification for farms in each topographic grouping; (c) type of farm classification within each group. With generally available information, *e.g.* census, farm program data, tax data, it is possible to classify a large proportion of all farms into the various sub-universes. For instance in one study this writer and his colleagues classified over one-half of an entire universe of 11,000 farms into topographic-size-type groups, using ten important variables—and without any field work. Over eighty per cent of the farms fell into twenty-one groups. Knowing the major characteristics of a typical farm in each of these groups, field work proceeded—the farms selected for enumeration being drawn by design from the twenty-one sub-universes. Farm enumeration for any given aspect of the farm business, *e.g.* individual enterprise input-output relations, labour-use, machine use, etc., ceased when a firm indication of stability in results was reached. This yielded great economy in conducting field work. In contrast to concentrating on data relating to financial factors, emphasis was placed on securing data on organizational features, physical input-output relationships, rotations, livestock systems, labour and machine use and other related aspects of the farm business.⁵

Such data provide the basic information necessary to answering the questions of within-farm use of resources (3). The analysis necessary for yielding these answers when one has data such as those described is of the

⁴ A striking illustration of what is meant is indicated in a quotation from a bulletin (8) in which the authors analyse a very large body of historical data. They state: "During the first five years of the 16-year period (1930-45) covered in this report, a major depression occurred; during the first ten years several localized droughts and two general droughts occurred; and during the last five years an unparalleled World War occurred."

⁵ Farm account data are valuable in strengthening such work as that proposed here. However, there is an increasingly strong belief that large expenditures of funds on farm accounts for research purposes cannot be justified. They can be defended as a service to account-keeping farmers, but one on which the expenditure of much in the way of public research funds is unwarranted.

synthetic or budgetary type. This makes it advantageous to call in the aid of production specialists in crop and livestock systems and in other subject-matter fields, and renders it possible to concentrate on problems of farm layout, cropping and rotation systems, and the livestock systems which operate well with proposed cropping systems. Further, such work lends itself to making forward-looking recommendations in contrast to historically based proposals.

That the methods proposed here lend themselves readily to examining the between farm problems on the one hand and the total agricultural *vs.* non-agricultural resource problem is a matter of no little importance.

In this connection we can be sure that throughout the 1930's agriculture was a dumping-ground for the industrial unemployed. The industrial expansion of the war period and the loss of farm labour to the armed services brought about a wholesome type of adjustment. Perhaps it went too far. Let us put ourselves in a position of being able to answer such questions in a fairly definitive way. More particularly let us provide the bases by which the agricultural industry can present the case against it again becoming a dumping-ground. Let us provide the bases by which Government policy regarding shifts of people out of and into farming can be made consistent with improving social efficiency.

One of the significant advances in farm management which has been in the making during recent years is developing and maintaining on a current basis (1) descriptions of farm universes, groups and sub-groups and (2) input-output data for major enterprises for each sub-group; these data provide the necessary groundwork for attacking, on a farm and area basis, almost any economic problem that arises—and yield good results in a matter of days and weeks rather than years. By way of illustration a recent journal article employed this method in evaluating the results which might be expected to arise from alternative crop-insurance proposals in a high risk Montana area (2).

We can, with a given set or assumed set of farm prices, make projections of the production of various farm products which would be economic. (Thanks to government policy of forward price guarantees, such price assumptions are becoming more reliable. Nevertheless, we appear to have done too little in the way of forward pricing in consideration of the wartime and immediate post-war demands for food). After that parenthetical remark, it can be stated that the production projections would be hedged by assumptions other than those relating to price. Thrown into the reverse context this research can be employed to test at what levels price supports should be set to achieve assumed levels of production. The more that high quality production economics research is available, the better will be production, or alternatively, price projections. Such research is extremely valuable and should be carried on continuously.

This research really provides the basis for production goals, which have in recent years assumed great importance in governmental economic programs. How to put economic relevancy into production goals or objectives is a most important need in the field of agricultural economics—and one with which this writer hopes to deal in some detail in a forthcoming paper.

Another methodological development on which much research will be done is in defining the area of farm management investigations in which controlled field tests or experiments can yield more reliable results than any other method. An illustration is in determining the economy of various methods of hay harvesting. Using the traditional survey procedure the within method variance is generally as great as the between method variance—and the results are of no significance. This difficulty can be overcome by controlled field tests of the various methods under examination.

While the writer makes what may appear to be sweeping method proposals for farm management work, he is fully aware that even at best our tools, while highly useful, are not yet refined. However, he is certain that improvement is coming. Much thought is being given particularly to the problem of measuring or getting quantitative indications of marginal net productivity of various input factors. On the other hand research is proceeding on the basic questions of the nature of the firm and entrepreneurship in farming, on questions of scale of operation, and so on.

On this question of marginal net productivity, however, while such measures are highly desirable, the policy implications of much agricultural data are clear when stated in terms of averages. Professor Schultz properly makes much of this point in a forthcoming work. Nor should we neglect the fact that even where we have only average productivity data, we often have the basis for making safe presumptions regarding marginal productivity.

LAND ECONOMICS AND FARM FINANCE

The writer's views on research needs in these subjects can be summarized in very few words. Strong criticism is directed at the organization of research at both federal and state levels in the United States, since it tends to give an autonomy to research in these fields. The central body of research in land economics must concern itself with the productivity of land; the central body of research in farm credit must concern itself with the productivity of those production instruments for which credit is or can be used. Research in both these fields must, then, be brought very considerably to the level of farm management and production studies. Once we have evaluated the productivities of the pertinent factors, the needs for institutional adjustments—which needs have seemed a preoccupation with specialists in land economics and farm finance—will be one of the products of this research. To the extent that studies of farm loan experience concentrate on questions of productivity (and thus show the presence or absence of capital rationing), they are very helpful in pointing to institutional weaknesses. But what study of farm credit could be as important to understanding the real problems of credit as Heady's purely farm management analysis, which showed the following marginal productivities for various input factors for a group of 738 random selected Iowa farms for 1939: *land* 0.05; *labour* 0.08; *equipment* 0.20; *livestock and feed* 0.84; and *miscellaneous inputs* 0.39 (1) ?⁶

⁶ These productivities mean that within the context of Heady's study one dollar of investment yielded at the margin the following (a) five cents in land, (b) eight cents in labour, (c) twenty cents in equipment, (d) eighty-four cents in livestock and feed, and (e) thirty-nine cents in miscellaneous inputs.

MARKETING RESEARCH

In the United States, the country in which the greatest support has been provided for farm marketing research, there has been an unfortunate tendency to divide this research into two fairly distinct branches:

(a) Institutional analyses which involve, for instance, co-operative marketing, milk collection processes, studies of tobacco auctions, direct marketing of hogs, and

(b) Price analyses which include historical studies of prices, marketing costs, the price-making process, marketing margins, statistical studies of demand and supply, and so on.

This separatism is unfortunate because, using the words of Professor Nicholls of the University of Chicago, it "has led to undue neglect of their poorly cultivated, but rich common ground". Treated separately, work in these branches of marketing cannot be carried to very fruitful ends. But when a marketing problem is treated with unity, it is possible to make findings regarding historical costs, margins, and statistical demand and supply functions have real meaning in terms of the institutional structure and operational problems of the market. Thus one can point to economies and diseconomies which will be of more than interest to those in the marketing agencies, to farmers, to the general public and to government. Nicholls, in a forthcoming publication, lists among problems which require treatment by this approach:

- (a) How efficient is the marketing system?
- (b) How competitive is price making in our major agricultural markets?
- (c) Studies of the interrelation of consumption, income and demand.
- (d) Supply analysis.
- (e) The relation between general agricultural policy and the marketing system.

He continues: "In such a broad framework, the economic theories of markets, imperfect competition, consumption, production, and uncertainty, fall logically into place suggesting fruitful avenues for empirical investigation and helping to assure that the institutional and technological data accumulated will be relevant to a broader body of economic principles. At the same time, by the constant interplay of theoretical hypotheses and actual data, more realistic refinements and suitable corrections of existing theory may be forthcoming"⁷.

There has been too little research on the marketing of grain in Canada. Farmers, the general public, and the government would be most interested in such studies. All have, willingly or unwillingly, a direct interest in this question. Can the Board of Grain Commissioners do full justice to the task required of it by law with as little in the way of research as appears to be available? Can the Board operate largely on the basis of accounting data? Does the legislation under which the Board operates require too little of the Board in insuring that we shall have an efficient grain marketing system? The real costs of marketing grain were reduced substantially as a result of the success of the Pools in the first several years of operations. Presumably the present situation is quite different from that of the 1920's. Why not let us have a look at the efficiency of our grain marketing system?

Again on other phases of grain marketing research there has been too little work. The study of the Wheat Board operations, for instance, would make an excellent thesis subject for an advanced degree; the study of the

⁷ Professor Nicholls' study cited in the references to this paper is an excellent illustration of such a work.

U.K. wheat contract and the proposed International Wheat Agreement should be carried on in a university, with adequate support provided by such a group as the Canadian Federation of Agriculture.

AGRICULTURE AND INTERNATIONAL TRADE

Because of the nature of Canada's resources, this country has an overpowering interest in foreign trade. This statement has been made so frequently as to have almost become trite. As research workers, what can we do that is consistent with Canada exploiting, fully, her interest in international trade? First we must recognize that the problem is much larger than the field of agricultural economics—that it requires the best talents of specialists in international trade and international finance and other fields of study.⁸

Questions of whether or not free international marketing of major farm products is more in the interest of the Canadian farmer and Canadian public than marketing through governmental and/or inter-governmental machinery, questions of the particular price and quota provisions which international agreements should include are much broader than the field of agricultural economics, and can be answered in a very partial way by agricultural economists. Even so it is very fitting that we ask ourselves what standards we should embrace as guides to thinking on such problems. To pose these in a very preliminary way:

(a) In periods like the present we must do all we can to prevent our export foods being over-priced relative to other farm products produced at home and abroad, but employing resources which can be switched to our export products, if this over-pricing should continue (*e.g.* as U.S. wheat and cotton under the parity formula).

(b) We must lend our support to every measure which will lead to a continuing high level of national income at home and abroad. We must support fully the work of the United Nations, and take leadership, particularly in the affairs of Food and Agriculture Organization, in developing, on an international basis, research programs which will aid us in finding methods of analyses, suitable to studying the implications of inter-governmental action in the farm product field.

(c) Considering the Canadian tariff to be a burden on agriculture, we should continue to examine its effects, product by product, in an effort to point to those particular tariffs where the employment and other "benefits" are small relative to the burden they impose in terms of higher farm costs and smaller markets for export industries.

FINAL COMMENT

Certain types of economic research are suited naturally to universities and foundations, and certain types to governmental agencies. Within the latter class it is necessary to conduct considerable research in the course of servicing various governmental programs. Thus there enters inevitably a confusion of what is research in terms of such standards as set forth in this paper and what is research in terms of servicing actual or proposed farm programs. In the U.S. Department of Agriculture this line is fairly clear since service research has been entirely or almost entirely taken out of the Bureau of Agricultural Economics and placed in the various department units which have administrative responsibility for the many farm programs. (This statement is not made with the purpose of implying that a parallel arrangement for Canada would be in our interest).

⁸ To become thoroughly impressed with the analytical and policy difficulties in this field one need only review the recent paper by Professor Schultz and the comments on it by Professor Black, Paul Yates, and Helen Farnsworth (6).

To make another general comment, we have done too little work on the place of and limitations on public works in relation to agriculture. Are there economic grounds for fairly large public expenditures on irrigation, on soil conservation, on rural electrification, on rural housing? How should we go about providing guides to policies covering these questions?

Another problem worthy of attention is how we should organize research for making it reflect on a most important problem—getting greater stability in farm incomes.

Returning to the field of agricultural economics after a five-year absence, the author feels that a new power is running through the profession. There seems a certainty that we can do much toward uncovering those essential economic relationships which must be known if we are to provide a basis for rational farm policy. Certainly we have enough in the way of tools to advance agricultural economics research in this country. We have the basis for showing that we can make excellent use of the level of financial support which our work clearly deserves. Let us get that support by showing what we have “on the ball”.⁹

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⁹ There is a real challenge to research in the excellent policy statement by W. J. Parker (5).

New Sectional Edition of "Biological Abstracts"

Commencing with Volume 22 of "Biological Abstracts", in January, 1948, a new Section, "J", will cover abstracts of Cereals and Cereal Products. It will include contributions on plant breeding, cultural practices, varieties, soil and weather relations of the crops; physiology, diseases, insect pests; storage of grain and flour; milling machinery and techniques; plant sanitation; baking and nutritional studies; biochemistry of cereals and cereal products; enzymes; and industrial microbiology as it affects cereals and their products.

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October, 1947

When requesting publications, please give date of Selected List of Accessions, and the list number of each item desired.

1. Meat technology; a practical textbook for student and butcher. Frank Gerrard. London, Leonard Hill, Ltd., 1946. 304 p. plates. Bibliography: pp. 299-300.
Subject headings: Animals, Geographical distribution of; Livestock—Breeds; Carcasses; Meat—cutting, food value, preservation, slaughtering.
2. Mathematics for the consumer. Raleigh Schorling, John R. Clark, and Francis Lankford. New York, World book company, 1947. 438 p. illus.
(A school text for mathematics in a home economics course, stressing household problems, good value, etc.).

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3. Rammed earth house; with an introduction by Clinton P. Anderson. Anthony French Merrill. New York, Harper and bros., 1947. xviii, 230 p. il.
4. Farm driers for your corn. Arnold Nicholson. (In Country gentleman, September, 1947. pp. 22, 77-79)
5. A combine from Germany . . . (In The Farmers weekly, August 29, 1947. p. 28)
6. Trouble-shooting tillage machinery. J. T. Ewing. (In Country guide. September, 1947. pp. 8, 24)
7. Care of galvanized roofing. C. H. Van Vlack. Ames, 1946. 6 p. fold. il. (Iowa state college agricultural extension service pamphlet 114)
8. Domestic spark arresters. Henry Giese. Ames, 1947. pp. 175-252. figs. tables. (Iowa state college agricultural experiment station research bulletin 348)
9. A brooder house for 250 to 350 chicks. R. R. Murphy and H. H. Kauffman. State College, 1947. 8 p. figs. (Pennsylvania state college agricultural extension service circular 306)

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11. Microbiology of foods containing chemical preservatives. Bernard Heath. (In Australian food manufacture, August 5, 1947. pp. 12-14)

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17. The fungi . . . Volume II. Frederick A. Wolf and Frederick T. Wolf. New York, John Wiley & sons, inc., 1947. 538 p. figs. References at ends of chapters.
"Volume II . . . deals specifically with the activities of fungi and focuses attention on the reactions of a fungus—the determination of what a fungus does, how it does it, and why it reacts in a certain manner . . ." From book jacket.

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18. The processing of guayule for rubber. K. W. Taylor. Wash., U.S. Dept. of agriculture. Forest service (1946) 59 p. (mimeo.) (1946 emergency rubber project)
19. Invertase: A monograph. Carl Neubert and Irene S. Roberts. New York, Sugar research foundation, inc., 1946. 62 p. (Scientific report series no. 4)
20. The utilization of sugar cane bagasse for paper, board, plastics, and chemicals; an annotated bibliography. Edited by Clarence J. West. New York, Sugar research foundation, inc., 1946. 146 p. (Scientific report series no. 3)
21. Sugars and sugar derivatives in pharmacy. P. S. Pittenger. New York, Sugar research foundation, inc., 1947. 53 p. il. (Scientific report series no. 5)
22. Agar in Australia. E. J. Ferguson Wood. Melbourne, 1946. 43 p. tabs. pl. (processed) (Australia. Council for scientific and industrial research bulletin no. 203)
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25. Certain hydrologic and climatic characteristics of the Southwest. J. H. Dorroh, jr. Albuquerque, University of New Mexico press, 1946. 64 p. maps. (New Mexico. University. Publications in engineering no. 1)
26. Le climat écologique de la Cuvette centrale congolaise. Etienne Bernard. Bruxelles, 1945. 240 p. figs. tabs. Bibliography: pp. 216-225. (Publications de l'Institut national pour l'étude agronomique du Congo belge)

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27. Composition of milk offered for sale in Pretoria. S. Bakalor and A. A. de Kock. Pretoria, 1946-7. 14 p. figs. tabs. (South Africa. Department of agriculture bulletin no. 272) (Reprinted from Farming in South Africa, July 1946)
28. The battle for oleomargarine. (In The Canadian dairy and ice cream journal, August, 1947. pp. 53, 60, 74)
29. Scandinavian dairy industries emerge from war's disruptions. A. J. Mullen. (In Foreign commerce weekly, vol. 28, no. 9, August 30, 1947. pp. 3-5, 34)
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31. Buttermaking: old and new. A. H. White. (In Canadian food industries, Vol. 18, no. 9, September, 1947. pp. 16-21)
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34. Dairying in war and peace. Olav F. Anderson. Wash., 1947. 61 p. figs. tabs. (U.S. Dept. of agriculture. Bureau of agricultural economics F. M. 61)
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39. Britain's vast new plan for agricultural expansion. (In United Kingdom information office bulletin, number 110, Gen. 2nd September, 1947. pp. 1-2) (processed)
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41. Long-range agricultural policy. Hearings before the Committee on agriculture, House of representatives, Parts 1-4, 1947. Wash., Government printing office, 1947. pp. 1-619.
42. A picture of Wisconsin viewed from the standpoint of resources, industry and agriculture. Madison, 1945. 120 p. il. tabs. maps. (Wisconsin state planning board bulletin no. 16)
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60. A new system for storing wheat. J. H. Pearce. (In The Northwestern miller, section 2, September 9, 1947. pp. 13a-16a)
61. Russia's wheat . . . (In Broomhall's corn trade news, August 20, 1947. pp. 380-1)
62. Harvesting and storing of ear corn. G. P. McRostie. Toronto, 1947. 10 p. fgs. (Ontario. Dept. of agriculture. Statistics and publications branch. Bulletin 452)
63. Conflicting opinions on the quality of bread wheats. T. R. Aitken and J. Ansel Anderson. (In American association of cereal chemists. Transactions. Volume 5, no. 1, April, 1947. pp. 6-18)

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64. The rose annual for 1947. Edited by Courtney Page. Croydon, England, the National rose society, 1947. 106 p. il.
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67. Recommended horticultural varieties and zonation map for Alberta. Prepared by the Alberta horticultural advisory committee. Edmonton, Dept. of agriculture, 1946. 18 p. fold.
68. New snapdragons, carnations, and lilies are in the making. Beltsville, 1947. 2 p. (mimeo.) At head of title: U.S. Dept. of Agriculture, Bureau of plant industry, soils and agricultural engineering.

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69. DDT and the insect problem. James C. Leary, W. I. Fishbein and L. C. Salter. New York, McGraw-Hill book company, inc., 1946. 175 p. fgs. Bibliographies at ends of chapters.
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72. The insect cranium and the "epicranial suture". R. E. Snodgrass. Wash., Smithsonian institution, 1947. 52 p. fgs. References: pp. 49-52. (Smithsonian miscellaneous collection. Volume 107, no. 7)
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74. General catalogue of the Hemiptera. Fascicle IV, parts 4-7. Z. P. Metcalf. Northampton, Mass., Smith college, 1945. 249 p.
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85. The old French-Canadian horse, its history in Canada and the United States. R. L. Jones. (Reprinted from *The Canadian historical review*, June 1947, pp. 125-155)
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87. Human factors in air transport design. Ross A. McFarland. New York, McGraw-Hill book company, 1946. 670 p. figs. tabs. Bibliographies at ends of chapters.
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92. Transportation of fresh fruits and vegetables. D. F. Fisher. (In *Food technology* Vol. 1, no. 3, July, 1947. pp. 449-460)
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Contributors: Walter R. Miles; D. W. Bronk; Selig Hecht; Otto Loewi; G. D. Birkhoff; Peter Debye; Henry Eyring; Isidore I. Rabi; K. C. D. Hickman; C. A. Elvehjem; Edwin J. Cohn.
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RESEARCH—Continued

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136. The essential role of the adrenal cortex in the hypertrophy of the ovotestis following ovariectomy in the hen. William Francis Hewett, jr. Chicago, 1946. 8 p. (processed) Thesis: University of Chicago.
137. Chick mortality caused by war-grade wheat offals. Brendan J. Senior and W. Kearney. (In Royal Dublin society. Economic proceedings. Vol. 3, no. 20, May, 1947. pp. 293-310)
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